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Opisthobranchiate Mollusca from Monterey

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DEPARTMENT OF COMMERCE AND LABOR
BUREAU OF FISHERIES
GEORGE M. BOWERS, Commissioner

OPISTHOBRANCHIATE MOLLUSCA FROM MONTEREY BAY, CALIFORNIA, AND VICINITY

[illegible]

FROM BULLETIN OF THE BUREAU OF FISHERIES
Volume XXV, 1905, Pages 109 to 151, Plates XVIII to XXXI

ISSUED MAY 24, 1906

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OPISTHOBRANCHIATE MOLLUSCA FROM MONTEREY BAY, CALIFORNIA, AND VICINITY.

By F. M. MACFARLAND,
Associate Professor of Histology, Leland Stanford Junior University.

OPISTHOBRANCHIATE MOLLUSCA FROM MONTEREY BAY, CALIFORNIA, AND VICINITY.

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This paper does not purport to be a complete list of the Doridoidea found in Monterey Bay and vicinity, but probably includes all of the commoner forms there represented. It is based upon collections made at various intervals since 1892, mostly in the immediate vicinity of Pacific Grove, Cal., and much of the manuscript has been for several years in practically the form here presented. It was not deemed desirable, however, to publish the descriptions of some of the rarer forms until the acquisition of further specimens had made possible more extended morphological study. Several species which now are represented by but a single individual in the collection are withheld for the present.

This study was conducted at the Hopkins Seaside Laboratory,[a] which is situated on the southernmost shore of Monterey Bay, about 120 miles south of San Francisco. The entrance to the bay is about 20 miles broad, and its northern and eastern shores present an almost continuous sandy beach, broken at long intervals by short rocky stretches; but on the south, from Monterey onward, the shore line is much more diversified, granitic cliffs rising to 40 or 50 feet above the sea and offering every variety of rocky coves and sheltered sand beaches, with a wealth of littoral animal and plant life. Point Pinos forms the southern headland of the bay, but the general character of the coast continues the same for several miles southward. Beyond Cypress Point opens another and much smaller bay, Carmelo Bay, at the mouth of the Carmel River, with the rugged and precipitous Point Lobos at its southern boundary. The most of the forms herein described were collected along the southern shore of Monterey Bay and the neighboring coast line as far south as Point Lobos and are mainly from the tidal zone, though some dredging has been done also.

The general systematic arrangement of the group here followed is modified from that of Prof. R. Bergh as given in his System der Nudibranchiaten Gasteropoden (Wiesbaden, 1892). For the convenience of other students of the group on the Pacific

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[a] My sincerest thanks are due to the directors of the Hopkins Seaside Laboratory, Professors Jenkins and Gilbert, for the facilities afforded me by that institution and for their unfailing kindly interest and encouragement in my work. The generous cooperation of Mr. Timothy Hopkins, of San Francisco, made possible the illustration of many of the species represented in this paper. I am indebted to the Smithsonian Institution for the assignment of a table in the Naples Zoological Station during the winter of 1902-3, where I had the valuable opportunity of studying and comparing many of the Mediterranean forms with those of the California coast. My grateful acknowledgments are due likewise to Professor Dohrn and his able staff.

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coast, the characters of all the families and subfamilies have been given, whether representatives of them have been taken in Monterey Bay or not. In several cases the generic characters given by Bergh have been slightly modified in unimportant points to admit forms belonging unmistakably to the genus.

For the identification of even the genera to which many of the nudibranchiate mollusca belong, it is necessary to make a full and careful dissection. This has been done in each case, but a complete morphological description of the forms discussed in the present paper has not been attempted, simply an abridged account of the anatomy sufficient for their ready identification being here contemplated. It has been my especial endeavor to secure adequate colored drawings of all species not elsewhere so illustrated. Unfortunately, with the exception of Alder and Hancock, Trinchese, Vayssière, and a few others, not many authors have published such illustrations. The lack is the more deplorable on account of the impossibility of preserving the beautiful colors, or even the natural form, in the museum specimens.

The following tabulation will indicate the general systematic relationship of the forms discussed in the present paper. With the exception of the early and fragmentary papers of Gould, Cooper, and Stearns, and several more thorough ones of Bergh, the California opisthobranchiate Mollusca are practically unknown. This fact accounts for the large proportion of new species found by me, which have been described in a brief preliminary paper published in the Proceedings of the Biological Society of Washington (vol. xviii, Feb. 2, 1905), under the title "A Preliminary Account of the Dorididæ of Monterey Bay, California." The types of these are deposited in the United States National Museum, and cotypes will be placed in the zoological museum of Leland Stanford Junior University and the museum of the Philadelphia Academy of Sciences;. also in the author's collection.

Order OPISTHOBRANCHIATA.
Suborder NUDIBRANCHIATA.
Section DORIDOIDEA.
Family A. DORIDIDÆ.
Subfamily I. Bathydoridinæ.
Subfamily II. Hexabranchinæ.
Subfamily III. Archidoridinæ.
1. Archidoris montereyensis (Cooper).
2. Anisodoris nobilis (MacFarland).
Subfamily IV. Discodoridinæ.
3. Discodoris heathi MacFarland.
4. Rostanga pulchra MacFarland.
Subfamily V. Diaululinæ.
5. Diaulula sandiegensis (Cooper).
6. Aldisa sanguinea (Cooper)
Subfamily VI. Cadlininæ.
7. Cadlina marginata MacFarland.
8. Cadlina flavomaculata MacFarland.
Subfamily VII. Kentrodoridinæ.
Subfamily VIII. Platydoridinæ.
Subfamily IX. Chromodoridinæ.
9. Chromodoris porteræ Cockerell.
Subfamily X. Miamirinæ.

Order OPISTHOBRANCHIATA—Continued.
  Suborder NUDIBRANCHIATA—Continued.
    Section DORIDOIDEA—Continued.
      Family B. DORIOPSIDIDÆ.
            10. Doriopsis fulva MacFarland.
      Family C. PHYLLIDIIDÆ.
      Family D. POLYCERIDÆ.
        Subfamily XI. Polycerinæ.
            11. Aegires albopunctatus MacFarland.
            12. Laila cockerelli MacFarland.
            13. Triopha carpenteri (Stearns).
            14. Triopha maculata MacFarland.
            15. Triopha grandis MacFarland.
            16. Polycera atra MacFarland.
        Subfamily XII. Goniodoridinæ.
            17. Acanthodoris hudsoni MacFarland.
            18. Acanthodoris brunnea MacFarland.
            19. Ancula pacifica MacFarland.
            20. Hopkinsia rosacea MacFarland.
      Family E. CORAMBIDÆ.
      Family F. DORIDOXIDÆ.

OPISTHOBRANCHIATA.

NUDIBRANCHIATA.

DORIDOIDEA.

Genital conduit triaulic, liver completely inclosed in the visceral mass, female duct bifurcated. Anal aperture postero-median, upon the dorsum, surrounded by the branchial rosette, or rarely between the peri-notæum and the foot.

Family A. DORIDIDÆ.

Branchial plumes in an arc or circle usually joined together at their bases, usually retractile into a common cavity. Rhinophores always with perfoliate clavus. Pharyngeal bulb never suctorial.

Subfamily I. BATHYDORIDINÆ.

Body (large) almost semiglobular, soft, pallial margin scarcely any; tentacles rather large, somewhat flattened, acuminate; branchial plumes many (6), entirely separate, nonretractile; the foot wide. Pharyngeal bulb very large, similar to that of the Tritoniadæ; labial armature none; mandibles large, flattened, masticatory margin smooth. Median tooth of radula somewhat compressed; lateral teeth numerous, hooked, edentulate. Hermaphrodite gland separate from the liver; penis unarmed.

Subfamily II. HEXABRANCHINÆ.

Body (large) soft, flattened, elongate oval; dorsum smooth; pallial margin wide, undulating, its margin thin, undulating; tentacles large, foliaceous, their margins fluted; branchiæ of many (6–8) separate arborescent plumes, retractile into separate cavities; the foot wide. Labial armature very strong, on each side a thick lamella made up of very minute hooks. Rhachis of radula naked; lateral teeth numerous, hooked, edentulate. Penis very long, unarmed.

Subfamily III. ARCHIDORIDINÆ.

Body not hard, somewhat depressed, the dorsum tuberculate or granulate, pallial margin not narrow; tentacles small; branchial plumes almost always tripinnate or quadripinnate; the foot wide. Labial armature none. Rhachis of radula naked; pleuræ multidentate, teeth hooked. Penis usually unarmed.

Genus 1. ARCHIDORIS Bergh.

Doris, auct.

Archidoris Bergh, Malacologische Untersuchungen (Semper, Reisen im Archipel der Philippinen, II, Bd. III), H. XIV, 1878; p. 616, Supplement-Heft I, 1880, p. 33; H. XVIII, 1892, p. 1092. Nudibranchiate Gasteropod Mollusca of the North Pacific Ocean, I, Proc. Acad. Nat. Sci. Phila., 1879, p. 106. Report on the Nudibranchiata, Challenger Reports, Zoology, X, 1884, p. 84. System der Nudibranchiaten Gasteropoden, p. 100, 1892. Die Opisthobranchien (Albatross Expedition), Bull. Mus. Comp. Zool., XXV, 1894, 10, p. 157.

Body not hard, subdepressed, notæum granular or tubercular; tentacles short, thick, with external longitudinal sulcus; branchial plumes not numerous, 3-4 pinnate; the foot wide, its anterior margin superficially sulcate. Labial armature none. Rhachis of radula naked, pleuræ multidentate, teeth hooked. Penis unarmed. Vagina unarmed.

1. **Archidoris montereyensis** (Cooper).

[Pl. XXIII, fig. 4; pl. XVIII, figs. 1-5.]

Doris montereyensis Cooper[a], Proc. Cal. Ac. Sci., II, 1862, p. 204; III, 1863, p. 158.

Archidoris montereyensis, Bergh, Mal. Unters., H. XIV, 1878, p. 624. Nudibr. Moll. North Pac. Ocean, Proc. Ac. Nat. Sci. Phila., 1879, p. 107. Syst. der Nudibr. Gast., p. 100, 1892.—MacFarland, Preliminary Account of the Dorididæ of Monterey Bay, Proc. Biol. Soc. Washington, XVIII, February 2, 1905, p. 37.

Body elongate, elliptical, but slightly depressed, the ends nearly equally rounded, dorsum somewhat arched. Dorsum not hard, everywhere closely set with low conical tubercules, in alcoholic specimens somewhat rounded. The largest of these are about 1 mm. in diameter and between them are smaller ones of varying size. Mantle edge thick, extending everywhere beyond the foot except over the tip of the tail when the animal is crawling. General ground color (pl. XXIII, fig. 4) light yellow, having a dusty appearance, due to extremely minute brown, greenish brown, or black dots thickly sprinkled over the dorsum everywhere. Larger patches of the same color are scattered over the dorsum, principally over the median portion, upon as well as between the tubercules, and more sparingly upon the branchial plumes. In alcohol the yellow color is lost, but the dark blotches turn to a dark blue shade and last for some time.

Length up to 50 mm., width 25 mm., height 12 mm.

Foot smooth, elongate, elliptical, light yellow, the anterior margin bilabiate, the upper lip much thicker and wider than the lower, no median notch.

Head inconspicuous, mouth small, a vertical slit, the sides continued into the short, blunt, fold-like tentacles which are auriculate with a clearly marked external groove (pl. XVIII, fig. 5). Rhinophores stout, retractile into conspicuous sheaths, the margins of which bear irregular tubercules similar to those of the general dorsal surface. Stalk conical, the clavus slightly dilated, conical, perfoliate, with 24-30 leaves on each side.

Branchial plumes 7, large, spreading, 3-4 pinnate, yellowish, sprinkled with minute brown or black spots giving them a dusty appearance, occasionally with larger patches of the same color. Deeply retractile within a prominent sheath with tuberculate margin. The plumes are arranged in a U-shaped arc around the anal papilla, which is truncately conical and often tipped with the brown or black color of the spots of the dorsum. Renal pore near the base of the anal papilla and slightly in advance on the right side.

Blood glands small, thin, the anterior one rudimentary, the posterior one behind and in contact with the central nervous system, narrow, ribbon-like, with lobulate margins, about 2 mm. long by 0.5 mm. wide.

Pharyngeal bulb strong, conical, its length about 5 mm.; breadth and height, 4 mm.; the radula sheath projecting behind and below for about 2 mm. as a rounded process. Lip disk rounded, covered with a thick, colorless cuticle.

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[a] The very fragmentary description of Cooper is as follows: "Pale yellowish, with scattered black spots (or entirely brown?); mantle rough tuberculate, or nearly smooth, dorsal tentacles knob-shaped, branchial rays bipinnate, short, in eight divisions, forming a crown-shaped expansion on the posterior third of the dorsum. Foot expanded into a broad, thin margin as wide as the mantle. Length, 3 inches; breadth, 1 inch; height, three-fourths inch; form, elongated oval. Dredged in 6 to 10 fathoms in Monterey Bay, adhering to fragments of sandstone; only 2 obtained in September." The specimens studied by Bergh were taken at Sitka, Alaska, and were sent to him in a dried condition. From a study of this material he assigns *D. montereyensis* to his genus *Archidoris* and gives general measurements of the body (shrunken) and the characteristics of the radula. Further than this no study of the species has been made.

Radula colorless, broad and short, about 4 mm. long by 3.5 mm. in width, deeply grooved, the teeth in 33 rows, the last 3 immature. Rhachis very narrow, naked. Pleuræ multidentate with 42–49 strongly hooked, compressed teeth. The outer face of the pleural teeth convex, the inner concave, the shaft bearing a large triangular, wing-like expansion on its inner margin, its upper edge thickened, the inner thin. Numerous fine, ridge-like striations diverge from the inner margin of the shaft and pass out into the wing throughout its whole extent, being especially prominent in the lower half (pl. xviii, fig. 3). Teeth increasing in size gradually from within outward (pl. xviii, fig. 2), the outermost ones decreasing rather rapidly, the general shape being retained (pl. xviii, fig. 1). Length of shaft of innermost teeth 0.114 mm.; length of hook (perpendicular to longest axis of shaft) 0.054 mm. Length of shaft of largest teeth of middle portion of row, about 0.240 mm.; length of hook of same, 0.150 mm.

Salivary glands long, whitish, ribbon-like, about 2 mm. in diameter, in length 10–12 mm., extending straight backward to the cardiac (posterior) end of the stomach. Stomach in antero-median cleft of the liver, large, saccular, its cardiac end below and posterior, its pyloric end on left anterior side of the visceral mass, the intestine curving upward and to the right along the upper anterior border of the stomach, thence backward in a deep groove in the dorsal surface of the liver to the anus. It is a slender, thin-walled tube about 1 mm. in average diameter and 25 mm. long.

Liver covered everywhere by the hermaphrodite gland, tapering posteriorly and rounded, in front divided into two large lateral lobes by a broad median cleft occupied by the stomach. The left lobe is rounded, the right with anterior and lateral flattened areas caused by pressure of the anterior genital mass. Bile cyst large, elongated, cylindrical, 4 mm. long by 2 mm. in diameter, opening into the stomach close to its cardiac end and entirely concealed by that organ, behind and below which it lies.

Hermaphrodite gland, closely covering the whole surface of the liver, yellowish. The hermaphroditic duct rises from the anterior end of the right lobe of the visceral mass with a diameter of 0.3 mm. and is very short, dilating at 1 mm. length into the whitish ampulla. The ampulla passes forward in a sinuous course, with an average diameter of 1 mm., to the anterior end of the genital mass, where it is closely looped into a coil and divides into the vas deferens and the oviduct. Its total length is about 24 mm., with an average diameter of 1 mm.

The anterior genital mass is large, plano-convex in form, its flattened side dorso-posterior, nearly circular in outline, its diameter about 11 mm., the convex surface directed outward and downward. The ventral and posterior margins are sharp, the anterior and dorsal ones rounded and occupied by the coils of the hermaphroditic ampulla and vas deferens, and the spermatotheca, respectively.

The everted glans penis is conical, unarmed, long and rather slender, about 7 mm. long by 1 mm. in diameter at the base, the tip blunt and flattened, recurved upward and backward. The præputium is conical and thick, about 3 mm. long. The muscular vas deferens arising from it, describing a number of closely coiled loops, passes along the anterior external margin of the genital mass to its origin as a branch of the hermaphroditic ampulla with no trace of a prostate gland along its course. Total length of vas deferens when straightened out about 28–30 mm., its average diameter 0.5 mm.

The vaginal opening is situated immediately behind the penis, above the duct of the nidamental gland, its duct slender, 0.5 mm. wide, coursing obliquely upward to the posterior end of the spermatotheca and opening into it after a slightly sinuous course of about 1 mm. (pl. xviii, fig. 4, *vd.*). The spermatotheca (pl. xviii, fig. 4, *sp.th.*) is spherical, thin-walled, about 5 mm. in diameter, lying on the upper margin of the genital mass and concealing the spermatocyst and its duct, which lie immediately outside and below it. It receives at its posterior end the very short common duct of the spermatocyst and the vagina. The spermatocyst (pl. xviii, fig. 4, *sp.c.*) is elongate, pear-shaped, its length 3 mm., its diameter 1.5 mm., pinkish in color, its duct as long as the cyst, with a diameter of 0.3 mm. and coursing backward under the spermatotheca on the upper outer convex face of the genital mass to unite with the very delicate uterine duct. The latter duct (pl. xviii, fig. 4, *u.d.*) 0.2 mm. long by 0.1 mm. in diameter, runs forward and passes into the nidamental gland close to the oviduct.

The nidamental and albumin glands form the greatest portion of the anterior genital mass and consist of a peripheral more translucent portion made up of closely coiled tubules inclosing a denser, more centrally placed white part, the other relations of the glands as usual in the genus.

The species which is here identified with *A. montereyensis* (Cooper) is comparatively common in Monterey Bay, occurring in rocky tide pools at nearly all seasons of the year. It is especially abundant on the piles of the wharf at Monterey, where it is found in company with the form next described and with which it might be readily confused at first sight. *A. montereyensis*, however, does not attain one-half the size of the latter, the distribution of the dark spots upon the dorsum is markedly different, and the tentacles are altogether unlike, being in *A. montereyensis* flattened and auriculate, with an external groove, while in *Anisodoris nobilis* they are elongate and digitiform. An examination of the internal anatomy reveals very important points of difference, notably the absence of a prostate gland in this species, while in *Anisodoris nobilis* a very large prostata is present.

A specimen deposited in U. S. National Museum (no. 181285).

Genus 2. **ANISODORIS** Bergh.

Anisodoris Bergh, Die Opisthobranchien der Sammlung Plate, Fauna Chilensis, Heft 3, 1898, p. 508.
Montereina MacFarland, op. cit., p. 38.

Form of body, tentacles and branchiæ as in *Archidoris*. Large prostate gland present. Vagina and penis unarmed.

In my preliminary paper upon the Dorididæ of Monterey Bay, a new genus, *Montereina*, was proposed for the reception of a species which differed strikingly from the other genera of the Archidoridinæ. My description of this form was written in 1894 practically as it appeared in 1905 in the paper cited above, and inadvertently, in revising the manuscript, the important paper of Bergh (1898) upon the Opisthobranchs of Chile in the Plate collection was overlooked. A new genus, *Anisodoris*, with which *Montereina* is practically identical, is described in this paper by Bergh. The slight difference of long cylindrical tentacles in the Monterey form is hardly sufficient to warrant its retention as a distinct genus, and *Montereina* must therefore be regarded as a synonym. To the genus *Anisodoris* Bergh has assigned the following species, all from Chile: (1) *An. punctuolata* (d'Orbigny). (2) *An. variolata* (d'Orbigny). (3) *An. marmorata* Bergh. (4) *An. tessellata* Bergh.

To this list is here added the following Monterey form, which is distinct from these. The genus thus far appears to be limited to the Pacific coast of North and South America.

2. **Anisodoris nobilis** (MacFarland).

[Pl. xviii, figs. 6–11; pl. xxii, figs. 1 and 2.]

Montereina nobilis MacFarland, op. cit., p. 38.

Body very large, plump, arched, but little depressed, sloping abruptly in front (pl. xxii, fig. 1), less so behind. Broad, elongate, elliptical in outline, the ends nearly equally rounded. General ground color a rich orange yellow, varying to light yellow in some specimens (pl. xxii, figs. 1, 2). Dorsum thickly tuberculate, the tubercles slightly inflated at the outer end, giving them a knob-like appearance. The largest tubercles are 1.5 mm. in diameter by 2 mm. in height, decreasing in size as the mantle margin is approached. Between the large tubercles smaller ones are everywhere closely set. Dorsum mottled everywhere between the tubercles with irregular blotches of dark brown or black. The total amount of this mottling may vary within wide limits, some individuals being quite light yellow while others are very dark (pl. xxii, fig. 2). Branchial plumes pinkish, tipped with white.

Length up to 20 cm., width to 6 cm., and height up to 3 cm.

Mantle everywhere projecting far beyond the foot save behind, where the tip of the tail protrudes for varying lengths. Sides of body not high, smooth, light yellow.

Foot broad, smooth, light yellow in color, abruptly rounded in front, more gradually so behind, its anterior margin bilabiate with a slight median notch.

Mouth relatively small, lips fleshy, the oral tentacles digitiform, bluntly conical, 5 mm. long, directed forward and curved outward toward the tips (pl. xviii, fig. 6).

Rhinophores stout, the stalk conical, the clavus perfoliate with about 24 leaves, deeply retractile within low sheaths, the margins of which are tuberculate.

Branchial plumes 6, large, spreading, tri- and quadripinnate, when fully extended covering the whole of the posterior dorsum. A thin membrane-like expansion joins the bases of the plumes.

Anal papilla large, cylindro-conical, blunt, occupying the center of the circle of branchiæ.

Renal papilla small, at right and in front of anal papilla, between the bases of the first and second anterior plumes on right side.

Blood glands in two distinct portions of nearly equal size, both flattened, finely lobulate, and irregular in outline. The anterior gland lies in front of the cerebral ganglia upon the pharyngeal bulb, is oval in general outline, the broader, thicker portion directed posteriorly. Length about 5 mm., width 4 mm. The posterior gland is transversely placed immediately behind the cerebral ganglia, extending on the right over a part of the anterior genital mass. Length 5 mm., width 6 mm.

Pharyngeal bulb large, conical, its length about 10 mm., width 8 mm., and height 6 mm., the radula sac projecting behind and below as a rounded cylindrical process of 4 mm. length. Lip disk 5 mm. in diameter, covered with a thick colorless cuticula, the opening an inverted T-shaped cleft.

Radula broad and short, deeply grooved, colorless or nearly so, the rhachis very narrow, naked. Teeth in 26 rows, the last 2 being immature. Pleural teeth large, strongly hooked, 55 in anterior rows, 60 in the middle rows, and 62 in the posterior rows. The general type of the pleural teeth is much the same as in Archidoris, the outer face being more convex than the inner. The outermost teeth increase rapidly in size toward the center of the row (pl. XVIII, fig. 7), the shaft and hook being nearly at right angles. The teeth from the middle portion of the row (pl. XVIII, figs. 8 and 11) have strongly curved hooks, much more so than in *Archidoris montereyensis* (cf. pl. XVIII, fig. 3), while the wing-like expansion along the inner margin of the shaft is but slightly developed. The innermost pleural teeth (pl. XVIII, figs. 9–10) decrease slightly in size, possess strong, curved hooks, strongly convex outer and concave inner and dorsal surfaces of the shafts.

Salivary glands long, narrow, band-like, passing backward near median line on floor of the body cavity beneath the stomach, with a total length of 15 mm. and a width of 2 mm. at anterior end and gradually narrowing posteriorly.

The thin-walled œsophagus leads directly backward to the large S-shaped stomach lying in a broad notch in the anterior end of the liver, its cardiac end below and in median line. The organ curves upward and to the left, its pyloric end passing obliquely forward to the right side into the intestine, receiving the broad bile duct on the posterior lower surface near the cardiac end. Length, about 24 mm., greatest diameter about 8 mm., these dimensions varying with the degree of distension. The intestine is a stout tube about 3 mm. in diameter at its origin from the pylorus, curving upward and diagonally backward from left to right in front of the stomach, and coursing backward in a deep groove on the dorsal surface of the visceral mass at the right of the median line to the anal papilla, in the center of the circle of branchiæ. Total length about 40 mm., its inner surface longitudinally plicate. The liver is bluntly conical in shape, yellowish, closely covered by the hermaphrodite gland, its apex directed posteriorly. In front is a deep wide cleft occupied by the stomach, above a dorsolateral longitudinal groove for the intestine, the right anterior lobe flattened into facets by the pressure of the anterior genital mass.

The hermaphroditic gland is yellowish, thin, closely invests the liver, and at its anterior upper border gives origin to the short, narrow, straight hermaphroditic duct, 2 mm. long by 0.3 mm. wide, which passes directly forward to the anterior genital mass, dilating into its wide, whitish ampulla, which is closely looped upon the inner anterior face of the mass. The diameter of the hermaphroditic ampulla is 1 mm., its length about 8 mm.

The anterior genital mass is large, its outer surface convex, its inner rounded in front and beveled obliquely from within outward behind. At its anterior inner margin the distal end of the hermaphroditic ampulla passes into the substance of the nidamental gland and divides into the spermatic duct and the oviduct. The former duct is short and narrow, passing almost at once into the large, whitish yellow prostate gland which lies upon the upper surface of the anterior genital mass. It is a large ovoidal body, with smooth outline, about 6 mm. long by 3 mm. in greatest diameter, convex above and flattened below. From its distal extremity passes the long, slender vas deferens, about 22 mm. in length by 0.6 mm. in greatest diameter, convoluted into a number of close loops along the anterior border of the genital mass, and dilating into the thick, conical penis (præputium), which is 2.4 mm. wide by 4 mm. long (retracted), with a short, conical, unarmed glans.

The uterine duct receives the duct of the spermatocyst a short distance from its point of emergence from the nidamental gland. The spermatocyst is spherical, 1.5 mm. in diameter, with a short duct about as long as the cyst. The large spherical grey spermatotheca, 5 mm. in diameter, is situated in the posterior half of the anterior genital mass, and receives the oviduct on its lower anterior surface close to the point of origin of the vaginal duct. The latter is about 10 mm. long and 0.3 mm. in diameter, dilating gradually at its distal end into the unarmed vagina. The nidamental and albumin glands are large, their structure and relations usually as in the Archidoridinæ.

Habitat: In rocky tide pools all along the coast of Monterey Bay from Monterey to Point Lobos and beyond. An abundant species found at all seasons of the year, most common during the summer months, and the largest dorid found in the bay up to the present time. Its bright yellow color makes it a very conspicuous object at low tide. Usually very abundant on the piles of the wharf at Monterey in company with the smaller *Archidoris montereyensis.*

Type no. 181284, U. S. National Museum.

Subfamily IV. DISCODORIDINÆ.

Body not hard, depressed; notæum minutely granuligerous, pallial margin rather wide; tentacles digitiform; branchial leaves nearly always tri- or quadripinnate; foot rather wide. Labial armature (labial lamellæ) made up of extremely minute, closely packed rods. Rhachis of radula naked, pleuræ multidentate, the teeth hooked. Penis usually unarmed.

Genus 3. DISCODORIS Bergh.

Discodoris Bergh, Jahrbücher d. deutschen malacozoologischen Gesellschaft, IV, 1877, p. 61. Mal. Unters., XII, 1877, p 518; Sup. I, 1880, p. 47; II, 1881, p. 108; XV, 1884, p. 678; XVI, 1, 1888, p. 805; XVII, 1890, p. 895. Rep. on Nudibr., Challenger Reports, X, 1884, p. 92. System der Nudibr. Gasteropoden, 1892, p. 102.

Body rather soft, rounded or oval in outline; the branchial aperture slightly crenulate, stellate, or bilabiate; anterior margin of the foot bilabiate, the upper lip more or less notched. Prostate gland large.

3. **Discodoris heathi** MacFarland.

[Pl. XXIII, fig. 6; pl. XVIII, figs. 12-17.]

Discodoris heathi MacFarland, op. cit., p. 39.

Body elliptical, broad, depressed; the notæum minutely tuberculate, nearly smooth. General color light yellow, darker toward the median line; the notæum sprinkled everywhere with extremely minute black or brown spots, giving the animal a general dusty appearance. Irregularly scattered over the dorsum a variable number of black, brown, or brownish-red flecks, the majority of them in the mid-dorsal region. (Pl. XXIII, fig. 6.) In alcohol the yellow color is lost and the dark spots become lighter.

Mantle margin thin, wide, crenulate, extending far beyond the foot, except at the tip of the tail. The foot rather narrow, its anterior end abruptly rounded, bilabiate; the upper lip deeply notched, the tail short and blunt.

The head is small and inconspicuous, being almost concealed by the mantle; the oral tentacles long and cylindro-conical (pl. XVIII, fig. 12), curved outward.

Rhinophores (pl. XXIII, fig 6) moderately large, cylindro-conical, the stalk stout, the clavus perfoliate with 10–15 leaves; the whole organ retractile within a sheath with low, thin, slightly sinuous or lobed margin. Color of the rhinophores slightly darker than the mantle, thickly sprinkled with minute black spots.

Branchial plumes 8–10, tripinnate, small, spreading, whitish-yellow, sprinkled with minute black spots, deeply retractile within a low sheath, the margin of which is similar to that of the rhinophores. Plumes arranged in an incomplete circle, closed behind by the low, conical anal papilla. Renal opening on the right and slightly anterior to the base of the anal papilla.

Total length of the animal up to 30 mm., its width 15 mm., and height 6 mm.

Mantle thick, fragile, densely spiculate, its inner surface thickly strewn with minute black spots and a few of the same color scattered over the pseudo-peritoneum above the central nervous system.

Pharyngeal tube large, conical, 2 mm. long, dilating rapidly into the large pharyngeal bulb, about 4.5 mm. in length, 3 mm. wide and 2.5 mm. high, the rounded end of the radula sac projecting behind and below for a distance of 1 mm.

Labial disk elliptical, convex, the opening vertical, slit-like, a lateral fold on either side about one-third the distance from the bottom to the top of the opening. The armature is light yellow in color and consists of short, closely set rods with squarish ends about 42 *μ* long by 3.5 *μ* wide, arranged in two lamellæ on the upper half of the sides of the opening. Each lamella is approximately quadrangular in shape, the upper border prolonged backward in a triangular point (pl. XVIII, fig. 15). Length of upper border 0.750 mm., of lower border 0.525 mm., height of lamella 0.750 mm.

Radula colorless, twice as long as wide, not deeply grooved. The teeth in 20 rows, with 36–42 teeth in each row. Rhachis narrow, naked. Pleuræ with 36–42 strongly hooked teeth (pl. xviii, fig. 13, 14). The first 20–25 of these vary but little in size, the hook slightly increasing in length, the shaft obliquely curved toward the median line of the radula and bearing a thin, wing-like expansion on its inner side. The outermost 12–16 pleuræ decrease very rapidly in size, are fitted closely together, and become reduced to thin concave plates.

The anterior genital mass is quite large, occupying the side and floor of the cavity in front of the liver. Its outer face is convex, the inner side presenting two faces oblique to each other and of about equal size, the crest between them being occupied by the spermatocyst.

The hermaphroditic duct (pl. xviii, fig. 16, *hd.*) emerges from the anterior lobe of the visceral mass, is very delicate and short, and dilates almost immediately into its ampulla (pl. xviii, fig. 16, *ha.*) upon the posterior inner face of the genital mass. The ampulla is large, grayish, 1 mm. in diameter by 10 mm. in length, describes a short loop backward and then courses forward along the outer surface of the proximal loop of the prostate gland to the anterior face of the genital mass, where it narrows, gives off the spermatic duct, and passes on as the oviduct (pl. xviii, fig. 16, *sp. d. ov.*).

The penis (præputium) is 2 mm. long by 8 mm. in diameter, the everted glans is bluntly conical, short, and unarmed. The vas deferens (pl. xviii, fig. 16, *v. def.*) is very long, narrow, looped upon the anterior face of the genital mass, 0.5 mm. in diameter by about 15 mm. long, and passes into the thick, pinkish-yellow prostate gland (pl. xviii, fig. 16, *pr.*), which lies in a loop directed posteriorly along the lower, inner margin of the genital mass, its inner portion pinker and more distinctly lobulated than the outer turn of the loop. Length of prostate 14 mm., its greatest diameter 2.5 mm. At the lower margin of the anterior face the gland contracts into the short spermatic duct, which branches off from the distal end of the hermaphroditic ampulla.

The small spermatocyst is oval in shape, 1 mm. long, and lies upon the vaginal duct; its duct quite short and opening into the uterine duct (pl. xviii, fig. 17, *sp. c.*). The spermatotheca is large, somewhat oval in outline, 3 mm. in longest diameter, and lies upon the crest between the inner anterior and posterior faces of the genital mass. Its two ducts join it close together (pl. xviii, fig. 17, *sp. th.*) the vaginal duct passing straight outward laterally (pl. xviii, fig. 17, *vag. d.*) and dilating into the vagina, its length being about 3 mm., its average diameter 0.4 mm.

The large albumin gland makes up a large portion of the genital mass, occupying the outer and lower part, the yellowish nidamental gland being inclosed by it and exposed on the inner and posterior faces of the mass. A long, flattened, narrow vestibular gland lies on the outer posterior face of the genital mass and opens into the vestibulum close to the vagina.

Habitat: In rocky tide-pools from Point Pinos to Monterey, rather rare. Usually most easily found during July and August, but has been taken during the winter months as well.

The species name is given in honor of Dr. Harold Heath, assistant professor of zoology in Stanford University, who has done excellent work upon the mollusca and to whose willing cooperation the author owes much assistance in collecting Pacific coast nudibranchs.

Type no. 181282 U. S. National Museum.

Genus 4. ROSTANGA Bergh.

Rostanga Bergh, Gatt. nördischer Doriden, Arch. f. Naturgesch., XLV, 1, 1879, p. 353. Malacol. Unters. Sup. H, II, 1881, p. 99. System der Nudibr. Gasterop., 1892, p. 105.

Notæum covered with minute hispid papillæ; branchiæ of simply pinnate leaves. Rhachis of radula naked; inner pleural teeth strong, with large body and small hook; the remaining ones less strong, erect, the body smaller, the hook elongated and more slender, the apices of the outer pleuræ with slender denticles.

4. Rostanga pulchra MacFarland.

[Pl. xxiv, fig. 8; pl. xviii, figs. 18–21; pl. xxi, fig. 109.]

Rostanga pulchra MacFarland, op. cit., p. 40.

Body elliptical, slightly depressed, the sides nearly parallel, the ends of body equally rounded, the mantle ample, covering the whole body except the tip of the tail when the animal is crawling. General ground color (pl. xxiv, fig. 8) bright red, varying at times from light yellowish red to deep scarlet, the back sprinkled everywhere with minute brown and black spots between the papillæ. The number of these spots is highly variable, in some individuals being very small, in others thickly set and often grouped in small patches, deepening the general color of the animal to a reddish brown. In alcohol the red color is quickly lost, the more permanent brown becoming very conspicuous upon the light yellowish white of the rest of the animal.

Dimensions of largest individual taken, 18 mm. in length, 10 mm. breadth, 5.5 mm. height, the average size usually found, however, being about 8–12 mm. long.

Dorsum covered everywhere with small, closely set, hispid papillæ, in height ranging up to 0.42 mm. in diameter to 0.08 mm., strengthened by divergent spicules extending from base to apex, the central portion of apex sunken and surrounded by the higher margin, elevated at intervals by the spicules into pointed projections.

Sides of foot nearly parallel, abruptly rounded in front, more tapering behind. Anterior margin deeply bilabiate (pl. xxi, fig. 109), the upper lip projecting beyond the lower, notched in the median line. Oral tentacles long and slender. General color of the ventral surface of foot, mantle, and sides of body a lighter red than the dorsum, rarely with fine black sprinklings.

Rhinophores (pl. xxiv, fig. 8) short, stout, translucent pink, the stalk stout and conical, prolonged above the clavus as a blunt, cylindrical process, nearly one-fourth the length of the whole organ. Clavus perfoliate, bearing altogether from 20–24 nearly vertical leaves (10–12 on each side). The leaves rather thick, triangular, with the apex directed downward, increasing in size regularly from before backward. Tip of rhinophore directed forward, the rest of the organ nearly vertical. Rhinophore entirely retractile within sheath, the margin of which is not appreciably elevated above the surrounding dorsum, and bears papillæ similar to those of the general dorsal surface.

Branchial plumes 10–12, erect, separate, nearly equal in size, slightly paler than dorsum, arranged in a circle, completely retractile within a sheath the margin of which is scarcely elevated and bears papillæ similar to those of the dorsum. Anal opening upon a low papilla in the center of the circle of branchiæ, the minute renal opening at its right and slightly in front.

Labial disk round, convex, covered with thick colorless cuticula, its opening ⊥ shaped. The lower half of the sides of the opening is occupied by a crescentic band of flattened hooks, the slightly concave border being directed forward, the upper angle much in advance of the lower, the lower ends being separated by a narrow space. Length of the armature, 0.24 mm.; its greatest width, 0.072 mm. The elements of the armature are arranged in 5 rows closely overlapping each other, their general shape being the same. The hooks of the most anterior row are blunt, flattened, and but slightly elevated and directed forward, the base rounded in front, the upper surface sloping backward beneath the hooks of the succeeding row. The elements of the remaining rows progressively decrease in size, the hooks are shorter and pointed. Length of longest element of the most anterior row, 21 μ; its width 6 μ, decreasing in the last row to a length of 6 μ, and a width of 5 μ (pl. xviii, fig. 21).

Radula broad, colorless, the median groove deep. Teeth in 65–80 rows, with 81 teeth in each row. Rhachis naked.

First pleural tooth thick, stout, the base short and broad, its hook heavy, slightly curved with 8–11 small denticles upon its inner margin (pl. xviii, fig. 18*a*). Height of base to apex of hook about 0.013 mm., the length of hook 0.008 mm. The succeeding 10 pleural teeth have a large, strong, broad base bearing a wing-like expansion thickened above upon its outer border, overlapping the adjacent tooth (pl. xviii, fig. 19). The hook is strong and thick, increasing in length and becoming more slender from about the twelfth tooth outward, the base diminishing in size, the hook longer, more slender, and less curved (pl. xviii, fig. 20*a*), passing over rather rapidly into long, slender elements (pl. xviii, fig. 20*b*, *c*), each with a small, compressed, wing-like base and long, slender, slightly curved hook, bearing at the distal end from 1 to 6 very long denticles upon the inner margin. These denticles arise in the distal third of the hook and, increasing slightly from within outward, reach nearly to the tip of the tooth and give it the appearance of being divided (pl. xviii, fig. 20*c*–*f*). The outer teeth of the rows are very flexible and slender, thus giving to this portion of the radula a brush-like appearance.

The hermaphrodite gland extends over the dorsal, lateral, and anterior faces of the liver as a thin layer, varying from 0.18 mm. to 0.3 mm. in thickness, being at its maximum about one-third the thickness of the liver in the same section. From its right anterior lobe arises the very narrow and short duct which extends obliquely forward and downward to the hermaphroditic ampulla. The anterior genital mass is large, being at least half as large as the hermaphrodite gland and liver combined. From above it is rectangular in outline, 3.2 mm. wide by 3 mm. long by 2 mm. thick. The hermaphroditic ampulla is whitish, slightly curved vertically, the convex face directed downward, 2.5 mm. long, with a greatest diameter of 0.5 mm. It courses anteriorly along the ventral face of the anterior genital mass in a groove between the nidamental gland and the spermatotheca. Its anterior end curves upward and enters the nidamental gland at its anterior inner face, giving off the spermatic duct and the uterine duct at its entrance.

Nearly two-thirds of the bulk of the anterior genital mass is made up of the very large, nearly spherical spermatotheca. In sections it measured 0.76 mm. high by 0.93 mm. long in an individual of 6.6 mm. total length, the transverse diameter in sections of another individual of the same size being 0.975 mm. It is lined with a single layer of large cubical ciliated cells becoming flattened posteriorly. The uterine and vaginal ducts open into it upon its outer and upper surface close together. The thick walled vaginal duct passes directly outward from it into the vagina, the thinner and shorter uterine duct receives the duct of the oblong-oval spermatocyst and curves directly downward to its origin as a branch of the hermaphroditic ampulla close to the entrance of the latter into the nidamental gland. The spermatocyst is about 0.52 mm. long by 0.22 mm. wide and lies transversely upon the upper anterior outer face of the anterior genital mass.

The spermatic duct dilates into a broad thin prostate gland which nearly envelops the spermatotheca, leaving only a small portion of its ventral surface free. The gland has thin walls and a large, sac-like lumen which passes anteriorly into the vas deferens. The vas deferens courses to the left and at about the median line loops back toward the right, passing straight outward and downward into the muscular penis (præputium). The retracted glans is blunt, cylindrical, of 0.3 to 0.5 mm. in length and about 0.15 mm. in diameter, and is entirely unarmed.

Habitat: Abundant everywhere along the coast in rocky tide-pools from Monterey to Point Lobos, upon a red sponge which incrusts the under side of overhanging rocks, and with which it is nearly identical in color. Has been taken at all times of the year in apparently equal abundance. The egg bands are of the usual form characteristic of the Dorididæ, a narrow flat ribbon attached by one edge in a closely wound coil to the sponge or to the rock, and of the same color as the animal. The spawn of *R. coccinea* Forbes as described by Alder and Hancock (Monograph British Nudibranchiate Mollusca, 1848) is white, while in hundreds of cases of that of *R. pulchra* seen by me it has always been bright red, and has been found at all times during the year.

Rostanga pulchra differs strikingly externally from the two previously known species of the genus—*R. coccinea* Forbes and *R. perspicillata* Bergh—in lacking the yellowish or whitish area around and connecting the rhinophores, but especially in the structure of the radula and labial armature, as shown in the following tabulation:

	R. coccinea.	R. perspicillata.	R. pulchra.
Color	Scarlet, sprinkled with black spots. Yellowish area around rhinophores and connecting them.	Brownish red or brick red, dotted with black spots. White area around rhinophores and connecting them.	Uniform bright red or scarlet sprinkled with dark spots.
Rows in radula	51-66	51-57	65-80.
Teeth in row	60-65	50-70	81.
First pleural tooth	No denticles on the hook	With 4-6 denticles on hook	With 8-11 denticles on hook.
Outer pleuræ	With 1 long denticle	With 1 long denticle	With 1-6 denticles.
Labial armature	A ring of rods in 12-15 rows, interrupted above and below.	A ring of 20 rows of rods	A slightly curved oblique crescent of 6 rows of hooks on each side.

Bergh (Mal. Unters., Sup. Heft II, 1881, p. 102) gives the labial armature of *R. coccinea* as a ring 0.18 mm. broad, apparently interrupted above and below and made up of 12–15 rows of closely packed stout rodlets up to 0.05 mm. in length, the most anterior ones with slightly enlarged distal ends. Serial sections of *R. coccinea* secured at Naples for comparison show this armature as a band of rodlets, clearly interrupted above and below, having a vertical breadth of 0.21 mm., the uppermost rodlets 0.006 mm. in height by the same in width, and increasing progressively in the succeeding rows below to 0.048 mm., the diameter remaining the same. In *R. perspicillata* Bergh (op. cit., p. 106) the labial armature forms a continuous ring of about 20 rodlets, in the broadest portion reaching 0.05 mm. in length. In *R. pulchra*, as described above, the elements of the armature are in the form of flattened hooks, overlapping each other closely and arranged in but 5 rows, ranging in length from 0.006 mm. to 0.021 mm. The whole armature is in the form of a crescentic band on either side, the concave face directed forward.

The relatively enormous spermatotheca and its relation to the prostate gland is a characteristic separating *R. pulchra* clearly from *R. coccinea* and *R. perspicillata.*

Type no. 181292, U. S. National Museum.

Subfamily V. DIAULULINÆ.

Body neither hard nor soft; depressed or subdepressed; notæum usually minutely villous, often silky; tentacles digitiform; branchial aperture rounded, crenulate, branchial leaves tripinnate; anterior margin of foot bilabiate, upper lip notched. Labial armature none. Rhachis of tongue naked. Pleuræ multidentate, usually hooked. Penis usually unarmed.

Genus 5. DIAULULA Bergh.

Diaulula Bergh, Gattungen nördischer Doriden, Arch. f. Naturgesch. XXXV, 1879, p. 343. On the Nudibranchiate Gasteropod Mollusca of the North Pacific Ocean (Sci. Results of the Explor. of Alaska, I, Art. VI), Proc. Acad. Nat. Sci. Philadelphia, 1880, pp. 40–46. System der Nudibr. Gasterop., 1892, p. 105. Die Opisthobranchien, Bulletin Mus. Comp. Zool. Harvard, XXV, 10, 1894, pp. 171–175.

Body fairly soft and depressed; notæum silky, minutely villous; tentacles digitiform; branchial aperture rounded, crenulate, branchiæ tripinnate; foot rounded in front, bilabiate, upper lip notched in median line. Labial armature, none. Rhachis of tongue naked. Pleuræ multidentate, teeth hooked. Penis unarmed, prostate large.

5. **Diaulula sandiegensis** (Cooper).

[Pl. XXIII, fig. 5; pl. XVIII, figs. 22–24.]

Doris (*Actinocyclus?*) *Sandiegensis* Cooper, Proc. Cal. Acad. Nat. Sci., II, 1862, p. 204; III, 1863, p. 58.
Diaulula sandiegensis Bergh, Nudibr. Moll. North Pac. Ocean, Proc. Acad. Nat. Sci. Phila., 1880, pp. 40–46.—MacFarland, op. cit., p. 41.

Body soft, elliptical, velvety, the ends equally rounded, somewhat depressed. Mantle extending beyond the head and foot everywhere except at the tip of the tail when the animal is crawling. Edge of mantle wide and thick, slightly crenulate, projecting 6–8 mm. beyond sides of body in alcoholic material. Dorsum everywhere minutely villous and velvety, pale yellowish in color with dark brown or black rings of varying size, number and position (pl. XXIII, fig. 5). In general these rings are arranged in two longitudinal series on each side of the median line with 3–6 rings in each row, but this is subject to much variation. The number may be increased to 20–30 irregularly scattered ring-like blotches or may be reduced to 2 or 3 very faint ones, and between these extremes all gradations may occur. The largest rings noted measured 8 mm. in diameter, though the average size is nearer 4 mm. for the large ones. Small patches of brown may also occur among the rings. The general color of the dorsum may vary from light yellow to deep brownish yellow or even chocolate.

Head entirely concealed by mantle, the mouth a vertical slit, the tentacles about 3 mm. long, finger-like.

Foot elongate oval, the ends rounded, the anterior end deeply bilabiate, the upper lip thinner, broader, and bearing a median notch.

Rhinophores conical, dilated in the clavus, perfoliate, with about 20–30 leaves, deeply retractile into a conspicuous sheath with crenulate margin.

Branchiæ 6 deeply retractile, tripinnate plumes inclosing the anal papilla in a nearly complete circle. Margin of the branchial sheath prominent, crenulate. Anal papilla conspicuous, conical, 3 mm. high, 1.5 mm. in diameter, attached anteriorly to the basal branchial ridge. Renal opening at right and in front of anal papilla, inconspicuous.

Pharyngeal bulb not large, about 4 mm. long, 2–3 mm. high and 3.5 mm. broad, the radula sheath very prominent on the lower hinder margin, projecting as a compressed, rounded, keel-like structure for about 1.5 mm. No labial armature save a simple cuticula.

Radula rather broad, about twice as long as wide in anterior portion, yellow. Teeth in 19–22 rows with from 26–30 teeth in each half row.

Rhachis broad, naked. Pleural teeth similar in shape, strongly falcate, compressed, the inner 2 or 3 (pl. XVIII, fig. 22) smaller than those following, the outermost ones also strongly reduced in size (pl. XVIII, fig. 23). Upon the inner side of each tooth a narrow wing-like expansion which is continued as a decreasing thickening up along the back of the tooth toward the tip (pl. XVIII, fig. 24).

Habitat: In rocky tide pools of the fucoid zone all along the southern coast of Monterey Bay. Not abundant but has been taken at all times of the year. The species has a wide range, having been recorded from Sitka, Unalaska, Puget Sound, Monterey Bay, Santa Barbara, and San Diego, and in a light colored variety, *D. sandiegensis*, var. *pallida* Bergh NNE. of Punta Delgada, off the coast of Patagonia in S. lat. 42° 24′, W. long. 61° 38′.

At Monterey the breeding season occurs principally during the summer months, but individuals have deposited their eggs in the aquaria at the Hopkins laboratory in December and January, and the broad white spiral egg bands of this species have been found in the tide pools at the same time, though not as abundantly as during the months of June, July, and August.

This species was discovered and superficially described by Cooper (1862) and afterwards more fully by Bergh (1880), whose careful account of the anatomy of the form, based upon specimens from Alaska, is amply sufficient for its ready recognition.

A specimen deposited in U. S. National Museum (no. 181288).

Genus 6. **ALDISA** Bergh.

Aldisa Bergh, Malacol. Unters., H. XIV, 1878, p. XXXVIII. Gattungen nördischer Doriden, Arch. f. Naturgesch., XLV, 1, 1879, p. 348. System der Nudibr. Gasteropoden, 1892, p. 106. Nudibranches et Marsenia provenant des Campagnes de la Princesse-Alice (1891-1897), Rés. Camp. Sci. Albert Ier de Monaco, Fasc. XIV, 1899, p. 7.

Tentacles tubercule-like or auriform. Pleural teeth erect, rod-like, the external margin serrulate. Glans penis armed.

6. **Aldisa sanguinea** (Cooper).[a]

[Pl. XXIV, fig. 7; pl. XVIII, figs. 25-26; pl. XXI, figs. 112, 114.]

Doris (*Asteronotus*) *sanguinea* Cooper, Proc. Cal. Acad. Nat. Sci., II, 1862, p. 204; III, 1863, p. 58.
Asteronotus? sanguineus Bergh, System der Nudibr. Gasteropoden, 1892, p. 111.
Aldisa sanguinea MacFarland, op. cit., p. 42.

Body somewhat depressed, oval, the ends about equally rounded. Dorsum everywhere thickly covered with small conical tubercules, the general color light to dark red (Pl. XXIV, fig. 7), sprinkled everywhere with very minute black spots. On the median line immediately in front of the branchiæ a large rounded or oval spot of black, another similar spot in median line just behind the rhinophores, which often is very much elongated or divided into 2, one behind the other. These spots may vary in size and number, but seem to be quite constant in color marking. In alcoholic specimens the black spots become greenish, the red color disappearing entirely.

Margin of mantle rather thick, covering the foot everywhere, except at the extreme tip of the tail, when the animal is crawling.

The foot is abruptly rounded in front, less so behind, the sides slightly converging posteriorly. Anterior margin of foot bilabiate, the upper lip thin, undivided. Color everywhere beneath light to dark red.

Total length up to 17 mm. with a width of 8 mm. and a height of 6 mm. Length of foot of same specimen, 13 mm; its greatest width, 6 mm.

Head small, concealed between mantle and foot; the tentacles short, auriform, with a clearly marked external longitudinal groove.

Rhinophores rather stout, the stalk cylindro-conical, the clavus dilated, conical, tapering to a blunt tip, perfoliate with about 12–15 leaves, the whole organ deeply retractile into a sheath, the low margin of which bears scattered, rounded tubercules, similar to those of the dorsum.

Branchial plumes, 8–10, simply pinnate or irregularly bipinnate, arranged in a circle, completely retractile into a sheath, with low tuberculate margin. Anal papilla low, centrally placed.

Blood gland very thin and small, the anterior lobe almost rudimentary, the posterior lobe lying transversely upon and behind the central nervous system.

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[a] Cooper's very fragmentary description is as follows: "Brilliant red, with a few large black spots irregularly distributed. Surface smooth; dorsal tentacles short; branchiæ composed of 8 simply pinnate rays, extending close to the posterior end of the body. Length, ½ inch; breadth, ¼ inch; height, about the same."

Pharyngeal tube large, funnel-shaped, the large lip disc thickened and glandular, with rather strong cuticula. In sections a delicate armature of extremely fine short rodlets may be made out. The pharyngeal tube is continuous into the pharyngeal bulb, with no sharp line of demarcation externally. The latter is somewhat conical, strong, and about 2.5 mm. long, inclusive of the radula sheath, which projects slightly behind.

The radula is rather wide, colorless, the teeth in about 70 rows. The rhachis is narrow, naked, the pleural teeth very numerous and slender, at least 70 to 100 in each half row, and of very striking form, which readily marks out this genus from any other of the Dorididæ. Each tooth is composed of a slender shaft arising from a strongly compressed, triangular base of uniform or but slightly changing size (pl. xviii, figs. 25, 26*b*); its distal end is slightly enlarged, slightly hollowed behind, and bears on its thickened external and upper projecting margins a single series of extremely small denticulations, which are continued down the outer border of the shaft for varying distances. in some cases reaching ½ the length of the tooth (pl. xviii, fig. 26*a*). The inner teeth are the longer, having a length of about 0.5 mm.; the outermost are much shorter, ranging down to 0.03 mm. The diameter of the shaft averages 0.003 to 0.004 mm., increasing gradually toward the distal end, where it measures 0.006 mm. to 0.008 mm. All the elements of the radula are very flexible, and the most careful manipulation is necessary to avoid bending and disarranging them.

The short œsophagus passes directly backward to the stomach, which lies in the anterior cleft of the liver. Its relations and those of the intestine are the usual ones in the Dorididæ. The liver is bluntly conical, the broader end directed forward with a deep median cleft occupied by the stomach. Above the liver is slightly flattened and behind is bluntly rounded. Its length in a large individual (16 mm. long) was 4.5 mm., with a greatest diameter of 3.5 mm. The right anterior lobe formed by the median cleft is shorter than the left one and faceted by the pressure of the anterior genital mass.

The ovotestis is a lobulated organ closely attached to the dorsal and anterior surfaces of the liver. In thickness it is nearly equal to the latter organ and thus makes up at least one-half of the bulk of the two. From the inner face of its left lobe the hermaphrodite duct is given off, passing immediately below the pyloric end of the intestine downward and to the right, in front of the lesser (anterior) curvature of the stomach, thence obliquely forward beneath the spermatotheca to dilate into the hermaphroditic ampulla. It is much larger than in Dorididæ of similar dimensions, reaching a diameter of 0.3 mm. The hermaphroditic ampulla is very large, its average diameter being about 0.7 mm., with a total length of about 6 mm. It is coiled in an S-shaped loop upon the lower anterior face of the anterior genital mass (pl. xxi, fig. 112, *h. amp.*). At its anterior end it constricts suddenly, gives off the narrow spermatic duct and passes into the nidamental gland. The spermatic duct is very short, dilating into the large thick-walled prostata, which describes a U-shaped loop upon the upper anterior face of the anterior genital mass, immediately above the hermaphroditic ampulla, and resting upon and against the spermatotheca (pl. xxi, fig. 112, *pr.*). Its distal end constricts into the muscular vas deferens, which describes a downward loop, returns and passes outward to dilate gradually into the penis (pl. xxi, fig. 112, *v. d.*). The glans penis is cylindrical, blunt, about 3 mm. long by 0.04 mm. in diameter, is covered with a firm cuticle and with 5–6 rows of small recurved hooks (pl. xxi, fig. 114). These hooks average 0.003 mm. in height and 0.005 mm. in length.

The vagina is conical in form, its greatest diameter about 0.4 mm., its length 0.6 mm., and passes rather abruptly into the vaginal duct, a slender, thin-walled tube which courses straight inward to the spermatotheca, into which it opens very close to the exit of the uterine duct.

The spermatotheca is a large spherical thin-walled organ, having a diameter of about 2 mm., and making up fully one-third of the volume of the anterior genital mass (pl. xxi, fig. 112, *sp. th.*). Into the uterine duct, close to its origin, opens the narrow, slender duct of the spermatocyst, a rather large, elongated, pear-shaped organ lying upon the groove between the spermatotheca and the nidamental gland and overlapping both organs. Its distal end curves outward, is doubled downward upon itself and is continued into a short duct which opens into the uterine duct of the spermatotheca, close to the latter. The total length of the spermatocyst is about 2 mm., its greatest diameter being nearly 0.5 mm.

The nidamental and albumin glands make up about one-third the bulk of the anterior genital mass. The former is much the larger, contains a large cavity and partially incloses the albumin gland on its inner face. The duct of the nidamental gland (pl. xxi, figs. 112, *n. gl. d.*) lies below and slightly behind the vas deferens and vaginal duct, their external openings occupying a similar relation.

This species presents many marked differences from the only other recorded species of this genus, *A. zetlandica* Alder and Hancock, and is without question distinct from it. It is here provisionally identified with Cooper's *Doris sanguinea*, though it may prove to be different, if Cooper's original specimens can ever be found. It occurs all along the coast from Monterey Bay to Point Lobos in rocky tide pools and is not at all rare during the summer months.

A specimen deposited in the U. S. National Museum (no. 181277).

Subfamily VI. CADLININÆ.

Body somewhat depressed; notæum granuligerous, scarcely rough; branchial leaves simply pinnate, bi- or tripinnate; tentacles short, flattened, acuminate; foot rather wide, with a deep anterior marginal sulcus. Labial armature lamelliform, almost annulate, of extremely small hooks. Rhachis of radula with a denticulate tooth; pleurae multidentate, pleural teeth hooked, the external margin serrulate.

Genus 7. CADLINA Bergh.

Cadlina Bergh, On the Nudibr. Gasterop. Moll. of the North Pacific Ocean, I, Proc. Phila. Acad. Nat. Sci., 1879, p. 114. Die Opisthobranchien, Bull. Mus. Comp. Zool., XXV, 10, p. 168. System der Nudibr. Gasteropoden, 1892, p. 108. Malacol. Unters. XVIII, 1892, p. 1100.

Glans penis armed with a series of hooks.

7. **Cadlina marginata** MacFarland.

[Pl. XXV, figs. 10–12; pl. XVIII, figs. 27–31.]

Cadlina marginata MacFarland, op. cit., p. 43.

Body elongate, elliptical, somewhat depressed, less abruptly rounded behind than in front. Notæum firm, covered everywhere with low tubercles, each one tipped with lemon yellow surrounded by a narrow ring of white and forming the center of a clearly marked polygonal area (pl. XXV, fig. 11). General ground color everywhere clear translucent yellowish white, the tubercles tipped as above. Upper and lower margins of mantle, and lateral and posterior edges of foot with a narrow band of lemon yellow (pl. XXV, figs. 10, 12), the tips of rhinophores and branchiae and their sheaths of the same color. In alcohol the light yellow color disappears and the animal becomes uniformly white. Varying degrees of contraction of the notæum in death cause the mantle tubercles to become more or less prominent within a wide range.

Mantle margin wide, broadly overlapping the foot everywhere except posteriorly (pl. XXV, fig. 10.) Foot narrow, nearly linear, tapering slightly posteriorly, in front abruptly rounded, bilabiate, the upper lip notched, thin, the lower one thick and fleshy. General ventral surface everywhere smooth and white, except the yellow border of foot and mantle.

Head small, rounded, mouth a longitudinal slit, the tentacles short, triangular, flattened, auriform, with a distinct external groove.

Rhinophores small, perfoliate with 16–18 leaves, the clavus conical, inclined backward, the cylindro-conical stalk erect, the whole organ completely retractile within a low sheath, the margin of which bears low tubercules tipped with lemon yellow.

Branchial plumes 6, bipinnate, spreading, arranged in an incomplete circle which is completed behind by the anal papilla. The plumes completely retractile within a low sheath with tuberculate margin, the tubercles tipped with lemon yellow.

Dimensions of large individual: length 45 mm., width 22 mm., and height 8–10 mm.

Pharyngeal tube cylindro-conical, 2.5 mm. long by 2 mm. wide, the pharyngeal bulb strong, 4 mm. long by 2.5 mm. wide by 3 mm. high, cylindro-conical, the radula sac projecting behind and below as a cylindrical, rounded prominence for about 1 mm. Labial disc convex, the opening triangular with the apex downward, the armature a broad yellow band, quadrangular below, narrowing on the sides and interrupted above, its greatest width 1 mm. The elements of the armature are closely set bifid hooks about 0.04 mm. in height (pl. XVIII, fig. 27.)

The broad radula has a length of 4 mm. and a width of 2 mm., with a shallow median groove. The teeth are in 90 rows, of which the last 4 are undeveloped in the sheath. The dental formula is 47–1–47. Rhachis with a single series of teeth, erect, hooked, the tip divided into 4–6 nearly equal blunt denticles (pl. XVIII, fig. 28*a*.)

Pleural teeth 47, the first one strongly hooked with 3 large denticles on its inner margin (pl. XVIII, fig. 28*b*), and 6–7 smaller ones on the outer margin. The successive pleuræ are of much the same shape, the tip becoming longer and more pointed, the denticles limited to the outer margin alone and increasing in number to 12 (pl. XVIII, fig. 29). The outermost pleuræ diminish in size, being finally reduced to compressed, jagged, slightly concave plates (pl. XVIII, figs. 30–31).

The liver is smooth, plump, bluntly conical in outline, the apex directed backward and lying just beneath the branchial rosette. Anterior end obliquely truncate toward the left side from about the middle of the organ. Length 17 mm., breadth 8 mm., and height 6 mm. in an individual of 35 mm. total length.

The hermaphrodite gland, yellowish in color, is distributed in thin lobules over the surface of the anterior and lateral portions of the liver, extending well backward toward its tip. The hermaphrodite duct is formed by the union of 2 ducts meeting at right angles on the anterior oblique face of the liver, coming from the upper right and left hand lobules of the hermaphrodite gland, respectively. The main duct is quite short, dilating into the long ampulla, the posterior end of which describes a loop upon the anterior median face of the liver and, passing forward, is looped back and forth upon the lower inner and anterior faces of the anterior genital mass. Immediately after giving rise to the vas deferens it passes into the nidamental gland close to the anterior border of the albumin gland.

The anterior genital mass is oval in side view, somewhat wedge-shaped from above, the thin end directed posteriorly and formed by the nidamental gland. The external face is convex, the inner one flattened. The lower anterior border is occupied by the coils of the hermaphrodite ampulla, immediately above which lies the dark spermatotheca, and upon this in turn the thick loop of the prostatic portion of the vas deferens. Greatest antero-posterior length of inner face of the anterior genital mass is 10 mm., its height 7 mm.

The penis is short, about 2 mm. in length, passing over into the vas deferens, at first slender and muscular, but rapidly increasing in diameter and becoming glandular. It courses inward and backward upon the upper anterior face of the anterior genital mass, doubles downward upon itself and returns outward and downward to its origin from the anterior end of the hermaphroditic ampulla. Its greatest diameter is reached about midway of its length, where it measures 1.4 mm., with a total length of about 10 mm. The glans penis is short, bluntly conical, and armed with minute hooks.

The vagina is short and narrow, tapering into the straight vaginal duct which courses directly inward and upward to the spermatotheca, into which it opens. Close to its entrance is the opening of the uterine duct which receives the duct of the spermatocyst, about midway of its length toward the nidamental gland, into which it opens close to the opening of the hermaphroditic ampulla.

The spermatotheca is somewhat spherical in shape, dark brown, and is about 3.5 mm. in diameter. It lies upon the anterior inner face of the anterior genital mass between the loops of the prostate portion of the vas deferens above and those of the ampulla of the hermaphrodite duct below. The openings of the 2 ducts are very close together upon the outer face of the organ.

The spermatocyst is pear-shaped, 1.4 mm. long by 1 mm. broad, and lies below and behind the loop of the vas deferens, its narrower end directed outward and downward, the duct short and slender, joining the uterine duct about midway of the length of the latter. The uterine duct passes as usual into the nidamental gland close to the anterior border of the albumin gland.

Type no. 181287 U. S. National Museum.

8. **Cadlina flavomaculata** MacFarland.

[Pl. XXV, fig. 9; pl. XIX, figs. 32–37; pl. XXI, fig. 110.]

Cadlina flavomaculata MacFarland, op. cit., p. 43.

Body elongate, elliptical, almost linear, depressed, bluntly rounded at the ends, less so behind than in front. Notæum thickly set everywhere with low rounded tubercules. General color yellowish white, inclined to cream, on each side of dorsum a row of 7–10 small lemon yellow spots borne upon low tubercules, the first one of these spots just outside of and behind the rhinophores, the last one outside of and usually behind the branchial plumes (pl. XXV, fig. 9).

Rhinophores black, brown or brownish yellow, very conspicuous against the pale dorsum. Branchial plumes white or yellowish white (pl. XXV, fig. 9). In alcohol the dark color of the rhinophores is usually permanent, the rows of lemon yellow tubercules become white and are usually easily distinguishable, while the general body color becomes paler or is lost entirely.

Mantle margin broad, thin, densely spiculate, everywhere widely overlapping the foot except behind, its under surface smooth (pl. xix, fig. 32).

Foot linear, bluntly pointed behind, in front abruptly rounded, bilabiate, the lower lip thick, fleshy, the upper one thinner. Head small, fitting into a depression in ventral surface of mantle, the tentacles short, flattened, blunt, auriform, with a distinct groove on outer margin (pl. xix, fig. 32).

Rhinophores rather large, erect, diverging, perfoliate with 10–12 leaves, the clavus forming three-fourths of the total length of the organ. Rhinophores deeply retractile within low sheaths, the margins of which are thin and slightly tubercular.

Branchial plumes small, 10–11, usually simply pinnate (pl. xxi, fig. 110), occasionally bipinnate in part, spreading, completely retractile within low sheath with thin edges.

Length of large specimen 20 mm., breadth 8–10 mm., and height 3–4 mm.

Labial disc strongly convex, the opening triangular with the apex directed upward. Labial armature a broad, light yellow band, quadrangular below, triangular on the sides, narrowing toward the top, where it is interrupted, the inner surface of the band everywhere convex. Greatest width 0.390 mm. The elements of the armature closely set, slightly curved hooks, bifid at the distal end, with a neight of about 24 mm. (pl. xix, fig. 33).

Radula small, broad, 1 mm. long by 0.6 mm. wide, with a very shallow median grove. Teeth in 77 rows, the last 4 immature. Dental formula 23–1–23. Rhachis very narrow, bearing a single series of teeth overlapped by the first pleural on either side (pl. xix, fig. 34). Base of rhachidian teeth large, the hook nearly horizontal, divided into 4–6 long, nearly equal blunt denticles (pl. xix, figs. 34–35). Pleural teeth 23 in number, the first lateral with a stout hook bearing on its inner margin 2–3 large denticles, on the outer margin 4–7 smaller ones (pl. xix, fig. 34). The successive lateral teeth beyond the first increase in height and in the number of denticles upon the outer margin up to 12–15, the inner margin being destitute of them. Toward the middle of the row the denticles become longer, more slender, and the whole tooth becomes saw-like in form (pl. xix, fig. 36). The outer 3 or 4 decrease in size somewhat (pl. xix, fig. 37*b*), but not so much as in the preceding species. Height of largest lateral teeth 0.054 mm., width of rhachidian tooth 0.012 mm., its length 0.018 mm.

The peritoneum is colorless and smooth, the blood gland lobulated and closely applied to the central nervous system, over which it lies. The liver is smooth, bluntly rounded behind beneath the branchial opening, slightly dilated about midway of its length and obliquely truncated in front from right to left, the face thus formed being in close contact with the anterior genital mass. Total length 6 mm., its greatest width 3 mm. Midway of the left side of the liver the pyloric end of the stomach is exposed, giving rise to the intestine, which arches across to just beyond the median line toward the right and then pursues an oblique course backward to the anus.

The hermaphrodite gland is thick and lobulated, covering incompletely the dorsal, lateral, and anterior faces of the liver. The hermaphrodite duct is very short, dilating into the ampulla, which, passing forward on the lower inner face of the anterior genital mass for about 3 mm., doubles back upon itself, describing a simple loop, and returns posteriorly to the anterior inner edge of the oblique face of the anterior genital mass. Here it gives rise to the spermatic duct and opens into the nidamental gland.

The anterior genital mass is large, bluntly conical in front, beveled from left to right behind, the flattened face thus formed fitting closely against the oblique anterior face of the liver. The outer surface is convex and made up almost entirely of the nidamental gland.

The spermatic duct, rising from the distal end of the hermaphroditic ampulla at the point where it enters the nidamental gland, is a very long, closely coiled tube lying upon the anterior end of the anterior genital mass. In it may be distinguished a proximal thicker glandular portion in a conspicuous loop upon the upper anterior face of the genital mass, and a more slender muscular portion, the vas deferens proper passing into the conical penis (præputium) after describing a double loop upon the anterior face of the genital mass. The glans penis is short, bluntly conical, and is armed with minute recurved hooks, the armature extending for a distance of 1 mm. along the lining of its canal.

The vagina is short, conical, passing over into the very slender vaginal duct which courses inward to the inner oblique face of the nidamental gland and passes into the small spherical spermatotheca, about 0.27 mm. in diameter. Close to its entrance arises the uterine duct, which receives the duct of the small pear-shaped spermatocyst and passes into the nidamental gland.

Habitat: Found in rocky tide pools all along the coast near Pacific Grove. Not rare. Found at all times of the year in small numbers. Type no. 181279 U. S. National Museum.

Cadlina flavomaculata may be readily recognized by its peculiar coloration, the rich brownish black rhinophores standing out strongly against the light yellowish white of the body. It is an extremely sluggish animal in confinement, scarcely moving from its place in the aquarium, even under the most favorable conditions.

The 2 new species of *Cadlina* here described may be easily distinguished in life from any other of the Monterey Dorididæ by their striking coloration. But 1 other species of this genus has been taken in the Pacific Ocean, *Cadlina pacifica* Bergh, from Alaska. The subjoined tabulation of the radulæ of the 3 Pacific, together with the European species, will aid in distinguishing them.

Radulæ of species of Cadlina.

Species.	Rows of teeth.	Formula.	Median tooth.	First pleural tooth.	Outer pleuræ.
C. repanda Alder & Hancock	51-70	29-30, 1, 29-30	3-4 denticles on each side of hook.	3-4 denticles on inner side; 7-9 denticles on outer side.	Up to 25 denticles on outer side.
C. pacifica Bergh	67-85	33, 1, 33	.....do	5-6 denticles on inside; 6-7 denticles on outside.	Up to 18-22 denticles.
C. marginata MacFarland	90	47, 1, 47	4-6 nearly equal denticles. No median hook.	3 denticles on inside; 6-7 on outside.	Up to 12.
C. flavomaculata MacFarland	77	23, 1, 23	.....do	2-3 denticles on inside; 4-7 on outside.	Up to 15.

Subfamily VII. KENTRODORIDINÆ.

Body rather soft, somewhat depressed, notæum very minutely granulated, pallial margin wide; tentacles conical; branchiæ tripinnate; foot rather wide, its anterior margin with a deep sulcus, the upper lip deeply emarginate. Labial armature none. Rhachis of radula naked, pleuræ multidentate, the teeth hooked. Penis armed with a stylet or unarmed; vestibular gland and dart present or not.

Subfamily VIII. PLATYDORIDINÆ.

Body coriaceous, rigid, flattened, fragile, its outline usually oval or rounded; notæum smooth or most minutely granulated, pallial margin wide; branchial opening usually few-lobed, stellate; tentacles finger-like; anterior margin of foot bilabiate, the upper lip deeply notched. Labial armature none. Rhachis of radula naked, pleuræ multidentate, the teeth hooked. Prostata large.

Subfamily IX. CHROMODORIDINÆ.

Body elongate, compressed, soft; brilliantly colored, often striped or spotted; notæum nearly always smooth; mantle margin broad in front and behind, the rest quite narrow; tentacles small, conical, often as if everted; branchial leaves usually simply pinnate. Labial armature strong, of very minute hooks. Rhachis of radula very narrow, often with minute compressed spurious teeth; pleuræ multidentate, teeth hooked, often with denticulate outer margin, the first one denticulate on both margins. No true stomach. Penis unarmed.

Genus 8. CHROMODORIS Alder and Hancock.

Chromodoris Alder and Hancock, Mon. Brit. Nudibr. Moll., Pt. VII, 1855, p. XVII.—Bergh, Neue Nacktschnecken der Südsee, III, Jour. Mus. Godeffroy, H. VIII., 1875, p. 72; H. XIV., 1878, p. 1. Unters. d. Ch. elegans u. villafranca. Mal. Blätter, XXV, 1878, p. 1. Neue Chromodoriden, Mal. Blätter N. F., I, p. 87. Mal. Unters., XI, 1877, p. 464; Sup. H. I, 1880, p. 14; II, 1881, p. 81; XV, 1884, p. 64; XVI, 2, p. 831; XVII, 1890, p. 929, 974. Beiträge z. Kennt. d. japan. Nudibr., II, Verb. d. k. k. zool.-bot. Ges. Wien, XXXI, 1881, p. 219. Report on the Nudibranchiata, Challenger Reports, X, 1884, p. 64. Rep. on the Nudibranchs, Bull. Mus. Comp. Zool. Harvard, XIX, 1890, p. 160. System, der Nudibr. Gasteropoden. 1892, p. 112. Ueber einige verkannte und neue Dorididen, Verh. d. k. k. zool.-bot. Gesellsch. Wien, XLIII, 1893, p. 415. Die Opisthobranchien, Bull. Mus. Comp. Zool., XXV, 10, 1894, p. 190. Nudibranches et Marsenia provenant des campagnes de la Princesse Alice, Res. Camp. Sci. Albert Ier de Monaco, XIV, 1899, p. 17.—v. Jhering, Beitr. z. Kenntniss d. Nudibr. d. Mittelmeres, Mal. Blätter, N.F. II., 1880, p. 1.

9. Chromodoris porteræ Cockerell.

[Pl. xxvi, figs. 13, 14.]

Chromodoris porteræ Cockerell, Three new species of Chromodoris, The Nautilus, XVI, 1902, 2, p. 19.—MacFarland, op. cit., p. 44.

In the summer of 1894 a single individual of *Chromodoris* was taken at Light-House Point, and the colored drawings of plate xxvi (figs. 13, 14) were made from it. The animal escaped down the overflow pipe of the aquarium soon after, and no specimens have since then been found in the vicinity of Monterey Bay. In 1901 Prof. T. D. A. Cockerell described the above species from La Jolla, Cal., where it appears to be quite common, as also at San Pedro. With his kind permission the following description (l. c.) and analytical table of species of *Chromodoris* found by him are here reproduced:

"Length about 11 mm., form of *C. universitatis*, but uniformly much smaller and quite different in markings. Deep ultramarine blue, including the whole of the foot; mantle with two rather broad longitudinal stripes of bright orange, not united posteriorly and ending anteriorly at the rhinophores, but anterior to the rhinophores is a transverse orange stripe; median stripe of *C. macfarlandi* represented by an inconspicuous, lighter-blue line; margins of mantle very narrowly pure white; foot wholly without marks, except that the hind end has a suffused whitish stripe. Rhinophores and branchiæ entirely retractile. Branchial plumes 11, in a circle, simply pinnate, entirely of the blue color of the mantle. After death a number of conical white papillæ (about 9 on each side) appear beneath the hind part of the mantle. After death the blue dissolves out and the body becomes a sort of pale greenish blue, with the dorsal stripe very white and the orange bands as in life.

"Habitat: In rocky pools at low tide, La Jolla, Cal., early in August, rather common. (Wilmatte Porter Cockerell.)"

Table of species of Chromodoris found at La Jolla.

A. General color a deep ultramarine blue, which after death dissolves out in formalin, or even in sea water.
  a. Small, about 11 mm. long, mantle with two orange stripes, foot without orange marks..............*C. porteræ* Ckll.
  b. Larger, over 60 mm. long, mantle and foot with numerous orange spots..........................*C. universitatis* Ckll.
B. General color purple, very brilliant, the color not dissolving out after death in formalin or sea water.
  a. Mantle with a yellow margin and three longitudinal yellow stripes; end of foot with an orange stripe.
C. macfarlandi Ckll.

The specimen taken at Pacific Grove was 22 mm. in length, twice that of the La Jolla specimens, but in all other external features agrees with them.

From my own notes of 1894 I take the following description:

Body elongate, linear, depressed, mantle about equally rounded in front and behind, mantle margin rather narrow laterally and behind, in front broad; tail not covered by the mantle save in its anterior portion. General body-color deep ultramarine blue; mantle with 2 broad longitudinal stripes of orange, entirely or incompletely united behind the branchial plume, ending in front just outside the bases of the rhinophores; in front of rhinophores a transverse arc of orange as if a continuation of the lateral stripe; a median light blue line extending from between the rhinophores to the branchiæ; margin of mantle narrowly edged with white; foot of same ultramarine blue as rest of body with a suffused median stripe of lighter blue upon dorsal surface of tail. Rhinophores perfoliate with 12 to 14 leaves, clavus slightly darker blue than the body of the animal, retractile within low sheaths with smooth margins. Branchiæ 9 to 11, simply pinnate, slightly lighter in color than the mantle, completely retractile within low sheaths with smooth margins.

Length, 22 mm. Radula? Reproductive system?

The above, together with the colored figures of plate xxvi, will suffice for the ready recognition of this species in life. I hope to be able soon to add detailed anatomical observations upon this and the other species of Californian Chromodoridinæ, which may throw some light upon the specific distinctions existing between them. Up to the present time there have been listed the following species of this genus from the western coast of North and Central America:

(1) *Chromodoris dalli* Bergh, Puget Sound.
(2) *Chromodoris californiensis* Bergh, Santa Barbara Islands, San Diego, Monterey (Dall).
(3) *Chromodoris universitatis* Cockerell, San Pedro, La Jolla.
(4) *Chromodoris agassizii* Bergh, Panama.
(5) *Chromodoris porteræ* Cockerell, La Jolla.
(6) *Chromodoris macfarlandi* Cockerell, La Jolla, San Pedro.
(7) *Chromodoris aegialia* Bergh, Gulf of California.

Sir Charles Eliot (Cockerell and Eliot, Notes on a Collection of Californian Nudibranchs, Journal of Malacology, XII, 1905, p. 37), comes to the well-founded conclusion that *Ch. universitatis* Cockerell is identical with the previously-described *Ch. californiensis* Bergh. The latter species is stated by Dall to have been taken at Monterey. It must be of extremely rare occurrence, as I have never found it in twelve years' collecting at varying times of the year.

Subfamily X. MIAMIRINÆ.

Form of body oval, somewhat depressed but arched; notæum cancellate, pallial margin rather wide; tentacles small or absent; branchiæ usually tripinnate; foot not narrow. Labial armature made up of minute rods or hooks. Rhachis of radula not narrow, naked, or with spurious teeth; pleuræ multidentate. No true stomach. Penis unarmed.

Family B. DORIOPSIDIDÆ.

Body nearly always soft, its form almost exactly as in true Dorididæ. Oral aperture pore-like, tentacles very short, adnate, rhinophores and branchiæ as in true Dorididæ. Notæum smooth or tuberculate, pallial margin usually wide and undulating. Foot wide as in true (cryptobranchiate) Dorididæ.

Oral tube simple, not glandular. Pharyngeal bulb an elongated cylindrical sucking tube, destitute of mandibles and radula. The posterior end of the liver deeply divided.

Penis armed with a series of hooks.

Genus 9. DORIOPSIS Pease.

Doriopsis Pease, Proc. Zool. Soc., 1860, p. 32. Amer. Jour. Conch., VI, 1871, p. 299.—Bergh, Nacktschnecken der Südsee. III, Jour. Mus. Godeffroy, VIII, 1875, p. 82; XIV, 1878, p. 21. Malacol. Unters., X, 1876, p. 384; Sup. I, 1880, p. 9; XV, 1884, p. 693; XVI, 2, 1889, p. 842; XVII, 1890, p. 963. Doriopsen des atlant. Meeres., Jahrb. d. d. Mal. Ges., VI, 1879, p. 42. Doriopsen d. Mittelmeeres, Jahrb. d. d. Mal. Ges., VII, 1880, p. 297. Report on the Nudibr., Challenger Rep., X, 1884, p. 117. System der Nudibr. Gasteropoden, 1892, p. 126. Opisthobranches prov. d. Camp. du yacht l'Hirondelle, Res. Camp. Sci. Albert Ier de Monaco, Fasc., IV, 1892, p. 16.

Doridopsis Alder and Hancock, Trans. Zool. Soc., V, 1864, p. 124.—Hancock, Trans. Linn. Soc., XXV, 1865, p. 189.

Body soft, smooth above. Buccal ganglia situated at posterior end of pharyngeal bulb.

10. Doriopsis fulva MacFarland.

[Pl. XXII, fig. 3; pl. XIX, figs. 38-40.]

Doriopsis fulva MacFarland, op. cit., p. 45.

Body elongate, elliptical, the mantle equally rounded in front and behind, slightly depressed, soft, the dorsal surface with low papilla-like elevations, nearly all of which bear a small central white fleck. General color of animal a rich yellow (pl. XXII, fig. 3), the foot and under side of mantle margin slightly lighter in color, the rhinophores darker, the branchial plumes yellowish white. In alcohol the yellow color is lost, but the white often remains. Mantle margin thin, crenulate, wide, extending well beyond the foot, its ventral surface showing a fine reticulate system of whitish lines, the meshes coarser nearer the body and becoming smaller toward the edge.

Foot elongate, elliptical, the anterior and posterior ends nearly equally rounded, the tail projecting but slightly beyond the mantle behind, the anterior margin bilabiate, the upper lip with a deep median notch, the lower lip fleshy, the lateral edge of foot thin.

Sides of body between mantle and foot very low, the color a lighter yellow than that of notæum. Reproductive openings in usual position upon a prominent rounded papilla.

Mouth opening very small, pore-like, entirely concealed between mantle and foot. Tentacles very short, flattened, adnate to the under surface of mantle, close together and directed forward.

Rhinophores not large, cylindro-conical, carried inclined forward and outward, the clavus slightly dilated, conical, the tip blunt, perfoliate, with about 18-20 leaves, the stalk cylindrical, smooth, one-third the length of the whole organ. Rhinophores completely retractile within conspicuous sheaths, with smooth, thin margins. Length of clavus, 4 mm.; of whole rhinophore, 6-7 mm.; height of sheath, 7 mm.

Branchial plumes 5, tripinnate, arranged in a circle, widespreading, deeply retractile within a sheath with high, thin, flaring margin, its edge smooth, its outer surface with small tubercules similar to those of the dorsum. Height of sheath 2 mm., its diameter 6 mm. Anal papilla at right of center of circle of branchiæ, bluntly conical. Renal opening inconspicuous, at base and slightly in front of the anal papilla.

Dimensions of large individual, length 65 mm., breadth 30 mm., height 12–13 mm. Width of mantle margin 8 mm.

Internal anatomy: Notæum thick, somewhat leathery in consistency. Pseudo-peritoneum colorless. Blood gland pale yellow, flattened, about 5 mm. long by 3.5 mm. wide, its anterior border resting upon the central nervous system, its left border in contact with the loop of the enlongated pharyngeal bulb.

Buccal tube cylindrical, white, 3 mm. long, dilating posteriorly into a conical portion, 4 mm. long by 2.5 mm. broad at its posterior end. From the center of the enlarged invaginated posterior face a long slender tube, 35 mm. long by 1 mm. wide, describes a loop to the left, constricts suddenly to half its diameter and then dilates at the upper margin of the visceral mass into a short, thin-walled tube which loops forward and downward to pass into the cavity of the liver.

The visceral mass is grayish, cylindrical, about 18 mm. long by 9 mm. wide, its posterior end rounded and deeply grooved vertically for the retractor muscle of the branchiæ. The anterior end is obliquely truncated upward and backward from the left side, the surface thus formed being variously faceted by contact with the anterior genital mass, the upper surface with a deep longitudinal groove for the esophagus and intestine. The cavity of the liver is large, centrally placed, with various short cavernous ramifications opening into it, and functions as a gastric cavity.

Hermaphroditic gland thin, yellow, covering anterior end and upper anterior half of the liver.

The hermaphroditic duct is short, about 3 mm. in length, narrow, and leads directly from the anterior border of the visceral mass into its ampulla (pl. XIX, fig. 38 *h. amp.*), a large, straight, yellowish, thin-walled tube lying along the inner border of the nidamental gland, 7 mm. long by 2 mm. broad, its anterior end recurved and narrowing into a delicate tube running outward along the superior face of the gland for about 2 mm., where it passes into its substance, giving off as it does so the spermatic branch. The spermatic duct (pl. XIX, fig. 38 *sp. d.*) passes directly into the left anterior lobe of a large glandular mass of a brownish yellow color, which overlies nearly the whole of the genital mass (indicated in fig. 38 by the dotted line), its lumen large and irregular, receiving branches from the various lobules of the gland. From the antero-median portion of this prostate-like gland the vas deferens appears as a strong white tube, describes a loop forward and passes into the penis. Length of vas deferens about 4 mm., gradually dilating into the penis. The penis (præputium) is conical, thick, about 3 mm. in length, the everted glans thick, cylindro-conical, about 1 mm. long by 0.6 mm. in diameter, the tip blunt. The whole glans is thickly set with a series of strongly-curved hooks arranged in quincunx, about 36 μ in vertical height and extending down the vas deferens for about 180 μ (pl. XIX, figs. 39–40).

The uterine duct is narrow, 2 mm. long, dilating as it nears the point of entrance of the duct of the spermatocyst and opens into the spermatotheca by a common tube with the vaginal duct (pl. XIX, fig. 38*a*, *u. d*). Spermatocyst (pl. XIX, fig. 38 *sp. c.*) long, tubular, coiled upon itself at posterior inner margin of the anterior genital mass, about 6 mm. long by 1.25 mm. in diameter, its duct (pl. XIX, fig. 38*a* *sp. c. d.*) long and narrow, running along the upper surface of the spermatotheca to its anterior side and opening into the uterine duct. Length of duct of spermatocyst 5 mm., its diameter 0.5 mm.

Spermatotheca (pl. XIX, fig. 38 *sp. th.*) very large, spherical, forming fully one-half the bulk of the anterior genital mass, covered dorsally by the brownish gland of the vas deferens. From its anterior face the vaginal duct passes outward directly into the vagina without any sharp line of demarcation. Length of vaginal duct about 3 mm., its diameter 1 mm.; length of the vagina 3.5 mm., its diameter 2–2.5 mm.

Doriopsis fulva is perhaps the commonest nudibranch to be found at Pacific Grove, occurring in the tide pools all along the coast at all times of the year, but perhaps most abundantly during the summer months. Its egg bands are in the usual form of a long flat ribbon, about 7 mm. in width, closely coiled, yellow in color and fastened to the sloping sides of rocks or to brown algæ, and are also deposited abundantly in the aquarium, in which the animal may be readily kept. Egg-laying may occur at any time during the year, but takes place mainly in summer.

Type no. 181286 U. S. National Museum.

Family C. PHYLLIDIADÆ.

Body subcoriaceous, oval or elongate-oval, subdepressed. Head indistinct, oral aperture porelike, tentacles short, connate at the base, forming a very short veil above the oral aperture, sulcate, digitiform or depressed, free, rarely (*Phyllidiopsis*) affixed; rhinophores retractile into sheaths, the clavus perfoliate. Ends of body almost equally rounded. Notæum dilated in its whole circumference, the pallial margin everywhere extending beyond the foot. Back almost always uneven, tuberculate; the tubercules forming mid-dorsal longitudinal series or arranged in quincunx; the halo of the anterior tubercules of the lateral series perforated by the rhinophores or contiguous to them; the halo of the posterior median series (genus *Fryeria* excepted) perforated by the anus or contiguous to it. * * * External portion of the under side of mantle margin smooth, the inner portion bearing thin transverse branchial lamellæ, interrupted in front by the depression for the head, on the right side by the genital papilla. Anal aperture postero-median upon the dorsum or, rarely (*Fryeria*), between mantle and foot, the cylindrical rectal tube projecting from its cavity, a groove on its right side leading below to the renal pore. Sides of body low, the foot well developed, narrower, and shorter than the mantle.

Oral tube large, suctorial, pyriform, symmetrical (usually), or asymmetrical on account of a regular or irregular glandular mass covering it; behind continued into the long, cylindrical pharyngeal bulb, destitute of mandibles and radula. Posterior end of liver not cleft. Penis armed with a series of hooks.

Family D. POLYCERIDÆ.

Branchiæ of pinnate plumes arranged in an arc or circle, united or separate at their bases, never retractile into a cavity. Clavus of rhinophores usually perfoliate. Pharyngeal bulb sometimes with a sucking crop.

Subfamily XI. POLYCERIINÆ.

Body more or less elongate and limaciform; dorsum scarcely set off from the sides, or with a prominent lateral margin; frontal limb more or less prominent, simple or ornamented with simple or composite appendages; on each side of the dorsum often either a single dorsal appendage (branchial) or several simple or composite ones in a series along the margin. Rhinophores with or without sheaths, the clavus usually perfoliate. Branchiæ of few plumes, the plumes often composite. Tentacles small, lobelike, foldlike, or auriculate. Foot not wide, usually rounded in front. Pharyngeal bulb simple. Buccal cavity usually armed with mandibular laminæ (often made up of minute rods). Rhachis of radula usually naked; the larger lateral teeth uncinate, the external ones simple, usually without hooks. Glans penis armed with a series of hooks.

Genus 10. ÆGIRES Lovén.

Ægires Lovén, Öfvers. Vetensk.-Akademiens Förh., I, 1845, p. 49. Ind. moll., 1846, p. 6.

Ægirus Lovén, Alder and Hancock, Monogr. part IV, 1848, fam. 1, pl. 21; part VI, fam. 1, pl. 17, figs. 13–15; part VII, 1855, p. 44, XIX, pl. 46 sup., fig. 17.—G. O. Sars, Moll. reg. arct. Norv., 1878, tab. XIV, fig. 10ab.

Ægires, Bergh, Beitr. z. Kenntniss der Polyceraden, II, 1880, Verh. d. k. k. zool.-bot. Ges. Wien, XXX, p. 649. System der Nudibr. Gasteropoden, 1892, p. 145.

Body somewhat limaciform, robust, rigid, with numerous tubercules above, mostly in rows; frontal margin narrow, tuberculate; pallial margin inconspicuous, tuberculate; clavus of rhinophores simple, their sheaths oblique; tentacles small, lobiform; branchiæ of few tripinnate leaves, each one protected by a peculiar individual lobe.

Labial disc with a band of minute rods close to the buccal aperture below; a large mandible present above. Radula moderately wide; the rhachis naked; pleuræ with many uniformly hooked teeth. Glans penis armed.

11. **Ægires albopunctatus** MacFarland.

[Pl. XIX, figs. 41–44.]

Ægires albopunctatus MacFarland, op. cit., p. 45.

Body arched, not at all depressed, robust, highest and broadest immediately in front of the branchial plumes and sloping rapidly behind into the broad, bluntly rounded tail, in front more gradually. Dorsum thickly set everywhere with short, blunt tubercules, cylindrical or with slightly expanded apices, arranged in irregular rows. Frontal margin narrow, closely set with tubercules, continued behind the rhinophores as a tuberculate ridge, becoming less and less prominent until the dorso-lateral margin is at length marked only by an irregular row of tubercules, curving upward and meeting the median dorsal row of the tail behind the branchiæ.

Foot narrow, linear, the sides nearly parallel, tapering abruptly behind into the bluntly rounded tail, in front truncate, undivided, the angles simply rounded.

Mouth small, inconspicuous, with a small, lobelike tentacle on each side.

Sides of body set off sharply from margin of foot, smooth below and in front, behind and above with three unequal rows of tubercules diverging slightly posteriorly.

Ground color white or yellowish-white with irregularly scattered small, dark-brown spots, or entirely white. Margin of dorsum and everywhere between the tubercules sprinkled with minute dots of pure white.

Rhinophores simple, cylindrical, truncate, 0.5 mm. long, completely retractile within prominent tuberculate sheaths, the 5–6 tubercules and the margin being high on the outer side and quite low on the inner one. Between the rhinophores a median longitudinal row of tubercules becoming irregular behind.

Branchial plumes 3, tripinnate, small, each one protected by a large irregularly tuberculate lobe at its outer side.

Length of large individual 13 mm., width 3.5 mm., height 4 mm.

Pharyngeal bulb short, strong, nearly spherical in shape, about 2 mm. long, slightly less in height and width, the radula sac projecting behind and below for 0.5 mm. The labial disc is convex, the opening triangular, clothed with rather thick cuticula. Above, forming the roof of the opening, is a single, broad, thick mandibular plate, a narrow girdle of fine rodlike cuticular thickenings guarding the opening. The mandibular plate (pl. XIX, fig. 41) is quadrangular in form, its anterior cutting edge very thick, straight, the posterior one much thinner, rounded and colorless. Width of mandible 345 μ.

Radula broad, deeply grooved, colorless, except in the posterior rows, which are yellowish. Teeth in 16–22 rows, the last two immature, the formula of the dentition 17–0–17. Rhachis narrow, naked. Pleural teeth 17, similar in form, strongly hooked. Shaft with the usual thin, winglike process on the inner margin, as shown in plate XIX, figure 44, which represents the fifth and sixth pleuræ of the sixth row. The innermost tooth is the smallest of the pleuræ, the succeeding four increasing in size pl. XIX, fig. 42), the remaining ones nearly equal, the outermost one slightly smaller (pl. XIX, fig. 43). Length of innermost tooth 0.09 mm., the outermost about 0.09 mm., average length of teeth from middle portion of row 0.108 mm.

The anterior genital mass is plano-convex, the plane surface directed upward and inward, elliptical, about 4 mm. long by 2 mm. broad. The spermatotheca is spherical, 1.2 mm. in diameter, and lies upon the anterior upper border of the genital mass. Opening into it close together are the vaginal duct and the oviduct, the former passing straight outward to the vagina, the latter short, receiving the duct of the small pear-shaped spermatocyst and uniting with the hermaphroditic ampulla.

The penis (præputium) is 0.450 mm. long by 0.210 mm. in diameter and passes gradually over into the slender vas deferens. The retracted glans is cylindrical, short, bluntly rounded at the end, 0.372 mm. long, its canal clothed with very minute, densely set hooks for 0.108 mm. of its length from the tip.

Habitat: Under overhanging rocks at low tide all along the coast from Monterey to Point Lobos. Not rare. Especially common upon sponges in a tunnel-like grotto formed by the waves near Pebble Beach, on Carmelo Bay. Very sluggish in movement, shuns the light, and soon dies in captivity.

Type no. 181282, U. S. National Museum.

Genus 11. LAILA MacFarland.

[Pl. xxvii, fig. 15; pl. xix, figs. 45-50.]

Laila MacFarland, op. cit., p. 46.

Body depressed; frontal and lateral margins narrow, set with club-shaped papillæ; rhinophores retractile, clavus perfoliate; branchial plumes few, tripinnate, nonretractile into a sheath; tentacles blunt, canaliculate. A flattened submarginal ridge on each side of the anterior end of the body just behind and above the tentacles.

No labial armature nor mandibles. Radula not narrow, the rhachis with a single series of flattened spurious teeth; first pleural tooth slender, hook-like, the second large, the remaining lateral teeth (10-13) smaller, flattened.

Glans penis armed.

This genus was proposed for the reception of the following form. It is allied to the genera *Triopa* Johnston and *Issa* Bergh, but differs from the first in the character of the frontal appendages and in the presence of spurious teeth on the rhachis of the radula. From *Issa* it differs in the absence of mandibles, and from both in the presence of the submarginal flattened ridge or lobe.

12. Laila cockerelli MacFarland.

[Pl. xxvii, figs. 15; pl. xix, figs. 45-50.]

Laila cockerelli MacFarland, op. cit., p. 47.

Body elongate, depressed, the ends rounded, the back slightly convex, the mantle margin prominent, overlapping the foot everywhere except behind.

Dorsum rounded (pl. xxvii, fig. 15), gently sloping to sides and anterior and posterior ends from region of the heart. Pallial margin bearing closely set, stout, club-shaped papillæ arranged in short oblique rows of 3-4 papillæ in each, increasing progressively in size from the outermost ones toward the median line. Length of papillæ 1-6 mm., breadth up to 1 mm. Each papilla is supported by an axial column of strong spicules. Median portion of dorsum with numerous scattered low tubercules of varying size, the largest near the median line, between them the surface smooth.

Head wide (pl. xix, fig. 45), sloping above, the frontal margin prominent, bearing papillæ similar to those of the sides of the mantle, the mouth opening large with conspicuous fleshy, plicated lips. Along the side of the head and anterior end of the body on each side a fleshy, flap-like subpallial ridge (pl. xix, fig. 45*a*), its anterior end just behind and slightly above the base of the oral tentacles, close below the pallial margin and parallel to it. The anterior and posterior ends of the ridge are rounded, its margin smooth. Length of ridge 2 mm., width 0.5 mm. Tentacles cylindro-conical, truncate, grooved on upper surface throughout the entire length. Length about 2 mm., diameter at base 0.7 mm., at apex 0.3 mm.

Foot linear, abruptly pointed behind and extending beyond the mantle, its margins thin and broad, in front squarish, slightly emarginate, the corners rounded, deeply bilabiate, the upper lip projecting beyond the lower and slightly concave (pl. xix, fig. 45.)

Rhinophores retractile within smooth margined sheaths. Stalk and clavus of nearly equal length, tapering to a blunted apex, the clavus slightly dilated, perfoliate with about 13 leaves.

Branchial plumes 5, nonretractile into cavity, tripinnate, in an incomplete circle the center of which is occupied by the anal papilla. Renal opening at right of anal papilla and near its base.

General color yellowish white, slightly translucent. Clavus of rhinophores, processes of pallial margin, and tail tipped with deep orange red, the branchial plumes and dorsal tubercules occasionally flecked with the same color. Dorsum marked with irregular network of transparent lines upon the whitish background, the effect of the multitudinous spicules shining through the skin.

Total length 20 mm., width 7 mm., height 6 mm. in the largest individual taken.

Pharyngeal bulb small, flattened, oval in shape, the radula sheath projecting slightly behind. Length 3 mm., width 2 mm., height 1 mm., in an individual of 15 mm. length. Lip disk directed obliquely downward, strongly convex, covered by thin colorless cuticula, the opening vertical, slit-like, with a slight T-shaped widening at dorsal and ventral margins, formed by shallow grooves at either side. A slight ring-like thickening of the cuticle marks the opening; behind this the cuticle has a faint tesselated appearance. No distinct mandibular plate present.

Radula nearly colorless, broad, with wide median groove. Teeth in 76–82 rows, the last 2 or 3 rows incompletely developed. Rhachis narrow, averaging 19 μ wide, with a single series of colorless flattened plates occupying nearly the whole width of the rhachis, nearly rectangular in form, slightly broader at anterior than at posterior end, the edges irregular in outline. Average length 0.018 mm., width anterior end 0.011 mm., posterior end 0.008 mm. (Pl. xix, figs. 46, 48). Pleural teeth 2, the first one (pl. xix, figs. 46, 47*a*) a simple, strongly curved hook directed vertically, its shaft somewhat expanded and flattened at its posterior end and fitting closely to the second pleural tooth. Length 0.036 mm. The second pleural tooth (pl. xix, fig. 47*b*) strong and heavy, the shaft irregular in form, oblique, at its upper end two strongly hooked cusps, the inner one smaller and directed inward, the larger outer one being more vertical, the two together forming a crescentic figure as seen from above. Below the inner hook a strong rounded elevation on the upper portion of the shaft, passing obliquely outward into a ridge. The lower end of shaft bluntly rounded, bearing a slight wing-like elevation on its outer face. Length of lateral tooth from end of shaft to crest 0.038 mm., diameter below inner cusp 0.011 mm.

Uncinal teeth 10–13 in number, closely set, pavement-like, presenting from above an arched, quadrángular outline with two pointed cusps at the lower angles strongly developed in the first 4 teeth (pl. xix, fig. 46 *c*, *d*; fig. 49 *e*, *f*), but much reduced and finally disappearing in the remaining outer ones (fig. 49 *g*–*n*), which become modified into flattened plates of considerable thickness.

Glans penis long, cylindrical, blunt, about 0.6 mm. in length by 0.04 mm. in diameter, with an armature of minute thorn-like hooks arranged in 10 to 12 slightly irregular longitudinal rows (pl. xix, fig. 50.)

Habitat: Under shelving rocks in tide pools along the coast, especially near Point Aulon and Point Pinos. Not rare. Much smaller individuals of the same species have been collected at San Pedro, Cal., by Prof. T. D. A. Cockerell, who has very kindly turned some of them over to me, together with his notes upon the same. I take pleasure in dedicating this species to him.

Type no. 181290, U. S. National Museum.

Genus 12. TRIOPHA Bergh.

Triopha Bergh, On the Nudibranchiate Gasteropod Mollusca of the North Pacific Ocean (Dall, Explor. of Alaska, I, Art. 6), II, 1880, pp. 261–266, (also in Proc. Acad. Sci. Phila., 1889, p. 112). System der Nudibr. Gasteropoden, 1892, p. 148. Die Opisthobranchien, Bull. Mus. Comp. Zool., XXV, 10, 1894, pp. 184–187.

Form of body somewhat limaciform; margin of the narrow frontal lobe with a series of short simple or composite granulose appendages; margin of dorsum with nodulate or short-branched appendages; rhinophores retractile, clavus perfoliate; tentacles short, calyciform, the outer margin in part cleft (auriform); branchiæ of few tripinnate leaves.

Mandibular plates triangular, made up of short, closely set rodlets. Radula rather narrow; rhachis with several series (4) of spurious teeth; pleuræ with several (3–18) rows of larger teeth; lateral teeth many (10–18).

Prostate gland large. Glans penis armed.

This genus was established in 1880 by Bergh to receive two species of nudibranchs from the Pacific Ocean. Of these the *Tr. carpenteri* (Stearns) occurs in Monterey Bay and is here given, while the two following species are new but undoubtedly belong to this genus.

13. Triopha carpenteri (Stearns).

[Pl. xxvii, figs. 16, 17; pl. xix, figs. 51–55; pl. xxi, figs. 108, 113.]

Triopa carpenteri Stearns, Description of a new genus and two new species of nudibranchiate mollusks from the coast of California, Proc. Cal. Acad. Sci., V, April 21, 1873, p. 78, fig. 2.—MacFarland, op. cit., p. 48.

Body limaciform, elongate, robust; anteriorly obtusely rounded, posteriorly rather bluntly pointed. Head obliquely flattened, semilunar, bearing a narrow frontal margin (pl. xxi, fig. 108) extending laterally beyond the rhinophores, continued behind into the less conspicuous dorso-lateral ridge, and bearing along its whole length a large number of irregularly lobed and tuberculate papillæ (pl. xxvii, figs. 16–17). Dorsum slightly arched, set off from the sides by a series of tuberculate processes (5–9), of varying size and form, borne upon an inconspicuous low ridge, in many cases almost indistinguishable. The first of these processes lies in continuation with the frontal margin in the region of the rhinophore, the last 2 or 3 behind the branchiæ. Scattered upon the minutely granuligerous dorsum many smaller simple or compound tubercles, in some cases approximating the size and complexity of the marginal ones. These are usually irregularly arranged, tending, however, in some individuals to form a median series, especially in the head region (pl. XXVII, fig. 16). Behind the branchiæ a median tubercle, often several scattered ones, and in front of the rhinophores 2 or 3 similar ones.

Rhinophores retractile into prominent sheaths, the margins of which are thin, smooth, or slightly wavy in outline. Stalk stout, erect; the clavus curved backward and upward, perfoliate with 20–30 leaves.

Branchiæ 5, large, tripinnate, wide spreading, entirely separate at the base; 1 anterior median plume and 2 pairs of lateral ones. In the center of this circle of branchiæ is the anal papilla, a conspicuous conical elevation bearing the anal opening at its summit. Near its base on the right side is the minute renal pore.

Tentacles short and stout, auriform, a longitudinal slit extending along their outer border, the margins of which fold together (pl. XXI, fig. 108, *a*). In alcoholic material these organs often take on a cuplike form, due to shrinkage.

Anterior margin of foot rounded, the sides nearly parallel, the posterior end rather abruptly pointed.

General body color white (pl. XXVII, figs. 16, 17), inclined to yellowish above, often sprinkled with minute white spots borne upon very small tubercles. Tips of branchiæ, clavus of rhinophores, appendages of frontal and lateral margins, and the numerous scattered tubercles of the dorsum a deep orange color. Numerous irregular blotches of orange are also scattered along the sides of the animal in no regular arrangement. The region of the body beneath the gill plumes is darker, caused by the deep brown liver shining through the skin. In alcoholic specimens the orange color is lost and the specimens are everywhere white.

Pharyngeal apparatus large and strong, in shape truncately conical, slightly compressed laterally, the radula sheath projecting below and behind as a rounded eminence.

Lip disk strongly convex, covered by a strong, brownish yellow cuticula, the opening inverted T-shape (pl. XIX, fig. 55). Behind the oral slit on each side the cuticula passes into a triangular, brownish yellow plate, broad above, its apex directed downward. In an individual of 5 cm. length this plate has an extreme length of 2 mm. and a height of 3 mm. and is made up of closely set slightly curved blunt rods, those of the anterior border having a length of about 0.150 mm. and a diameter of 0.004 mm.

Radula broad, deeply grooved, dark amber in color. Teeth in 33 rows, of which 3 are immature at the end of the sheath. Rhachis broad, bearing 4 rows of flattened plates (spurious teeth). The inner 2 rows of these plates, in the older portion of the radula, are quadrangular, about 180μ in width by the same in length, grayish yellow, the anterior margin thickened and smooth, the lateral and posterior ones irregular (pl. XIX, fig. 51). In the younger, posterior portion of the radula these plates become lighter in color, trapezoidal in shape, and much wider than long (pl. XIX, fig. 54); e. g., in the thirtieth row, length of plate 0.150 mm., width of posterior margin 0.240 mm., of anterior margin 0.165 mm. The outer row of median plates is made up of more triangular thickenings, the rounded and slightly thickened anterior margin being much narrower than the posterior one, the outer margin prolonged backward, especially in the posterior portion of the radula (fig. 54), where it becomes a long process extending under the pleuræ. Pleural teeth yellow, strongly hooked, of nearly uniform shape and size. The number varies in different individuals from 9 to 18. In five different radulæ the number of pleural teeth was 13, 18, 10, 9, 14, though for each radula the number is constant in all the rows. The base of each hook bears a wing-like process usually directed at right angles to the direction of the hook, and hence easily overlooked (fig. 53). The uncini (fig. 51), quadrilateral in general outline, vary from 9 to 18 in number in different radulæ, while in the same radula the number is not a constant one for all of the rows. A conspicuous longitudinal crest directed toward the median line is borne by most of the uncini. It gradually decreases in size toward the outer portion of the radula and is entirely lacking in the outermost three or four uncini (pl. XIX, figs. 51, 52).

The esophagus is a nearly straight muscular tube passing almost directly backward from the pharyngeal bulb, 10 mm. in length and reaching a diameter of 3 mm. At the anterior border of the visceral mass it dilates into the stomach, which lies in a deep, oblique groove in the anterior end of the liver. The stomach describes a simple loop from right to left, its pyloric portion, emerging from the liver on the lower left-hand side, curving upward and forward upon the upper face of the liver, thence in a broad loop backward to the anus. Total length of the intestine about 23 mm. The liver is bluntly conical behind, its surface smooth, the anterior end bluntly flattened. The oblique groove in which the stomach is included divides it almost completely into two unequal lobes.

The hermaphroditic gland covers nearly the whole surface of the liver with its rather thick lobules. The hermaphroditic duct is very long and slender, and, arising from the anterior dorsal side of the groove in the liver, courses forward and downward to the posterior face of the anterior genital mass, where it describes a series of irregular loops between the spermatotheca on the left and the nidamental and albumin glands on the right, this portion being slightly more dilated than the first part of the hermaphroditic duct, thus forming the hermaphroditic ampulla. At the anterior end of the nidamental gland the ampulla constricts again, gives off the spermatic duct, and passes into the nidamental gland. The spermatic duct dilates almost at once into the long, thick, lobulated prostate gland, about 14 mm. in length by 2 mm. in breadth, which describes a loop (pl. XXI, fig. 113, *pr.*) upon the anterior face of the anterior genital mass, the distal end of the loop being again bent upward upon itself. A convoluted vas deferens succeeds the prostate for about 4.5 mm., dilating at the upper anterior surface of the anterior genital mass into the obliquely placed cylindrical ampulla, 4.5 mm. long by 2 mm. in diameter, its distal end directed toward the median line of the animal and doubling sharply outward toward the penis, into which it dilates. Glans penis and distal portion of lining of its lumen armed with minute hooks.

The vagina, 4 mm. in length by 1 mm. in extreme diameter, passes straight inward into the short vaginal duct, which opens through the outer anterior wall of the large spherical spermatotheca. The latter organ (pl. XXI, fig. 113, *sp. th.*) is about 5 mm. in diameter and makes up about one-half the bulk of the anterior of the genital mass. From its anterior face is given off the uterine duct close to the entrance of the vaginal duct. After a short course this duct passes, as usual, into the nidamental gland at its anterior inner face, receiving midway of its length the very short and slender duct of the spermatocyst. The spermatocyst (fig. 113, *sp. c.*) is pear-shaped, 2 mm. long by 0.7 mm. in greatest diameter, and is placed transversely upon the upper anterior portion of the nidamental gland in contact with and partly covered by the proximal end of the prostate gland.

Dimensions of largest preserved specimen, scarcely at all shrunken: Length, 60 mm.; height, immediately in front of branchiæ, 29 mm.; greatest width, 15 mm.; width of head, 15 mm.; maximum height of dorso-lateral processes, 3 mm.; length of foot, 57 mm.; its greatest breadth, 7 mm.

Habitat: On brown kelp of the fucoid zone and under overhanging rocks in tide pools everywhere along the rocky coast from Monterey to Point Lobos. Altogether the most common nudibranch of the region and the most conspicuous one, owing to the contrast of the bright orange color of its appendages with the white of the body. It is avoided by the tide-pool fishes as apparently inedible, its bright colors seemingly serving a warning purpose.

A specimen deposited in U. S. National Museum (no. 181291).

The fragmentary description of Stearns (1873)[a] is based entirely upon external features, but is sufficient to render certain the identification of living specimens. The foregoing brief anatomical description, especially the structure of the radula, shows that this is a species distinct from *Triopha modesta* Bergh, with which it has been united by the latter writer (Bergh, 1894, l. c.).

14. Triopha maculata MacFarland.

[Pl. XXVIII, fig. 18; pl. XIX, figs. 55a–59; pl. XXI, figs. 106, 107.]

Triopha maculata MacFarland, op. cit., p. 49.

Body limaciform, strongly rounded above, plump, the back passing over insensibly into the sides save for the line of processes which indicate the boundary. Sides slightly compressed, a shallow longitudinal groove immediately above the margin of the foot. Foot linear, bluntly rounded in front, less so behind. Head flattened in front, sloping forward from the rhinophores to the wide semicircular frontal margin, which bears a fringe of from 10 to 12 short, stout processes, each of which toward its distal end branches into several blunt or knoblike divisions, which may in turn be branched or knobbed (pl. XXVIII, fig. 18). This frontal margin extends laterally below the rhinophores and in its prolongation along the dorso-lateral margin is a series of 4 to 6 short, branched processes essentially similar to those of the frontal margin. Posterior portion of the body sloping rapidly downward from a point just in front of the branchiæ into the short, blunt tail, which is highly arched above.

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[a] "Animal slug-shaped; anteriorly obtusely rounded, posteriorly pointed, somewhat attenuated; cephalic tentacles clavate, upper part of same of an orange color, below white; gill plumes 5, arborescent, resembling fern leaves, tipped with orange; plumes and tentacles $\frac{1}{16}$ inch in length; the former situated in the middle of the back somewhat posterior to the center. Six tentacular processes on each side, tipped with orange and $\frac{1}{32}$ inch long; also short tentacular processes in front of the head; body $1\frac{1}{4}$ inches in length, translucent white, covered with fine papillæ of an orange color. Habitat: Monterey, at Point Pinos, near the light-house, on the under side of granite rocks at edge of laminarian zone."

Rhinophores stout, club-shaped, rising from a conical base and expanding above into a broader clavus, directed backward and in turn tapering to a blunt tip. Length of clavus the same as that of the stalk, or nearly so, about 3 mm. Clavus perfoliate with about 18 plates, which are habitually carried in a nearly vertical position. Rhinophores retractile into conical sheaths about one-third the height of the whole rhinophore. Margin of sheath smooth or slightly crenulate, fluted longitudinally.

Below the broad semilunar frontal margin (pl. XXI, fig. 106) the rounded, full-lipped mouth, sucker-like in general appearance, at each side continuous with the oral tentacles. Oral tentacles auriform, directed forward and outward, the base cylindrical, outer half deeply grooved on upper side and transformed into a rolled plate, truncate at top with a wavy, sinuous margin (pl. XXI, fig. 107). Greatest diameter of tentacles equal to one-half their total length.

Branchiæ on posterior dorsum arranged in a circle about the anus in 5 tripinnate divisions arising from separate bases. Anterior plume unpaired in median line, the remaining 4 paired and laterally placed. Plumes low, wide spreading, nonretractile.

Anal opening at summit of conspicuous cylindrical papilla in the center of the circle of branchiæ.

Renal opening an inconspicuous slit on the base of the anal papilla on its right anterior side.

Color of dorsum and sides yellowish brown, usually of very deep shade, but in some individuals quite light. Dorsum and sides of body everywhere thickly set with small bluish-white round or oval spots, each one forming the center of a very slight polygonal eminence bounded by narrow orange-yellow lines upon the dark-brown background (pl. XXVIII, fig. 18). Foot below orange yellow with fine dark-brown flecks save at the margins, which are clear deep orange, shading off above on the sides into the deep yellowish brown of the dorsum. In smaller individuals the general colors are usually lighter, tending to a light orange, the lighter bluish-white spots being smaller and less conspicuous. Frontal and dorso-lateral processes and tips of branchial plumes bright orange or vermilion, shading below into dark brown. Stalk of rhinophore yellowish, leaves and antero-median line of clavus and margin of the sheath edged with bright orange red.

Pharyngeal bulb very large and strong, conical, slightly compressed laterally, the radula sheath projecting behind and below as a rounded eminence. Length 4 mm., width 2.5 mm., height 2 mm. in an individual of 15 mm. total length.

Labial disk oblique, oval, somewhat convex, the opening of an inverted T or Y shape (pl. XIX, fig. 59). Cuticula not thick, colorless, prolonged inward to form the tubular mouth lining, its sides continuous with the dark yellow, triangular mandibular plates characteristic of the genus. These plates are broadest above, the apex directed ventrally, and the anterior and dorsal margins are of nearly equal length, forming a right angle at their junction. The plates are made up of short, flexible, blunt, cross-striated rodlets having a diameter of about 3 μ.

Radula broad and short, deeply grooved, light yellow in color, and made up of about 14 rows of teeth. Rhachis broad, bearing 4 series of flattened plates (spurious teeth). The 2 innermost rows are quadrangular in shape, colorless, the anterior margin thickened and fairly smooth, the posterior one jagged and irregular (pl. XIX, fig. 57, *a*). These plates increase in length from the anterior (older) end of the radula backward, and also, though less, in width, the general quadrangular shape remaining the same. The outer rows of rhachidian plates are made up of flattened triangular elements, slightly larger toward the sheath than in front. They are about as long as broad and bear a more or less extensive thickening in the central region, the lower inner corner of which is occasionally prolonged into a slight cusp (pl. XIX, fig. 57, *b*). Pleural teeth 4 in older portions of the radula, usually 5 toward the sheath, large, strongly hooked, of nearly the same size and shape, the shaft with a winglike expansion on the dorsal side (pl. XIX, fig. 55, *a*, 58). Uncini (pl. XIX, figs. 56) 7 to 8 in number, the first ones slightly prismatic in form, gradually becoming reduced to elongated flattened plates. The first 4 or 5 of nearly the same size, then decreasing rapidly to the outermost ones. A well-developed longitudinal crest, directed toward the median line and slightly overlapping the adjacent tooth, is borne by all except the outermost 2 or 3 uncini.

The œsophagus is relatively short, being but 3 mm. in length, is curved to the left, and passes into the large thin-walled saccular stomach, the greater portion of which lies in front of the liver and entirely free from that organ, its pyloric portion only being inclosed in a deep oblique furrow which divides that organ into a smaller anterior and a larger posterior lobe. The intestine courses to the left in this groove, doubles downward and forward, thence describing a loop upward to the dorsal surface of the viscera, where it passes in a wide curve over the surface of the anterior genital mass posteriorly to the anus.

The hermaphroditic gland covers the anterior upper face of the liver, its duct arising from the upper surface close to the pyloric end of the stomach by the union of two main branches, which are lost in fine ramifications in the substance of the gland. The duct is short, dilating into the long convoluted whitish ampulla which courses forward, passing beneath the anterior genital mass in a series of loopings in a groove between the nidamental gland on the right and the large spermatotheca on the left. The total length of the hermaphroditic ampulla is about 12 mm., nearly one-half the total length of the whole animal. At the anterior face it passes into the nidamental gland, giving off the spermatic duct, which emerges from the substance of the gland and at once dilates into the thick lobulated prostate gland. This organ is broad and describes an S-shaped loop upon the anterior and inner faces of the anterior genital mass, forming with the spermatotheca, which it closely covers, fully one-half the bulk of the mass. Its distal end passes into the narrow muscular vas deferens, which, after a very short and somewhat tortuous course, dilates into its spindle-shaped ampulla, 2 mm. long and 1 mm. in diameter, lying obliquely upon the dorsal face of the anterior genital mass and inclosed in the loop of the intestine. The wall of this ampulla is very much thickened and muscular. Beyond it the vas deferens doubles outward upon itself and courses obliquely forward and outward, dilating into the præputium, a cylindro-conical structure 2.5 mm. long and 1.5 mm. in greatest diameter. At its base projects the blunt glans penis, armed with minute hooks.

The vagina is short and cylindrical, passing straight inward for 2.2 mm., when it makes a sharp turn posteriorly and, tapering for 1.5 mm., passes into the much narrower vaginal duct, which, with a length of 1 mm., opens into the spermatotheca upon its upper face. The spermatotheca is a large spherical organ, 2 mm. in diameter, its anterior lower and inner faces nearly covered by the loops of the large prostate gland, which also overlaps a portion of its upper surface. The exit of the uterine duct from the spermatotheca is 1 mm. distant from the entrance of the vaginal duct and is situated upon its anterior face. The uterine duct is slender and passes downward and outward, being completely concealed by the overlying lobules of the prostate. It is about 2.5 mm. in length, and just before entering the nidamental gland receives the duct of the spermatocyst, a small pear-shaped sac lying upon the upper anterior face of the anterior genital mass, its surface exposed between the distal portion of the vas deferens and the top of the prostate gland.

The nidamental-albumen gland complex is small, about 2.5 mm. in length, 2 mm. in height, and 1 mm. in thickness. Its outer surface is convex, the inner irregularly faceted. The gland is about equally divided between the albuminous and nidamental portions, the former occupying the upper and the latter the lower portions, respectively. The relations of the ducts are as usual.

The largest specimen taken had a total length of 52 mm., breadth 10 mm., and height 11 mm., though the majority of individuals are much smaller than this, averaging perhaps 30 to 40 mm. in length.

Habitat: Abundant everywhere during the summer months in rocky tide pools all along the coast from Monterey to Point Lobos. During the winter months it is not so abundant, but is never entirely lacking.

Type no. 181276, U. S. National Museum.

15. **Triopha grandis** MacFarland.

[Pl. XXVIII, fig. 19; pl. XIX, figs. 60–64.]

Triopha grandis MacFarland, op. cit., p. 50.

Body large, the largest specimen measuring 80 mm. in length, 25 mm. in width, and 30 mm. in height in alcoholic material. Plump, not at all depressed nor compressed, highest in region of the heart and sloping rapidly backward to tip of the short, blunt tail, more gently sloping forward.

Head flattened above, with a conspicuous semicircular frontal margin bearing 8 to 12 tuberculate or branched processes (pl. XXVIII, fig. 19). Frontal margin extending laterally well beyond the region of the rhinophores. Dorsum arched, smooth, of a yellowish-brown color, flecked everywhere with bluish spots or entirely plain, the processes of frontal margin and dorso-lateral region, the tips of the branchiæ, and tip of the tail yellowish red. Dorso-lateral margin marked out by a series of 4 to 6 branching processes similar to those of the frontal margin but longer, reaching a length of 10 mm., the branchings quite short.

Foot linear, rounded in front, more gradually tapering behind to the bluntly pointed tail.

Mouth directed obliquely downward, the tentacles blunt, auriform, 3 mm. long, the outer half in the form of a rolled plate, the opening upward.

Rhinophores fairly large, perfoliate with about 20 leaves, the stalk stout, conical, the clavus conical, inclined backward, completely retractile within conspicuous cylindrical sheaths with smooth margins.

Branchiæ 5 in number, tri- and quadripinnate, wide spreading, their bases separate, arranged in a circle around the anus. Anal opening at the top of a large cylindro-conical papilla, the renal opening slit-like, situated on the base of the anal papilla at the right anterior side.

Pharyngeal bulb large, slightly conical, not depressed nor compressed, the radula sheath projecting from the ventro-posterior surface as a rounded enlargement. Salivary glands long, band-like, 2 mm. broad, extending back under the liver for about 10 mm., the distal ends connected in a loop.

Labial disk oval, but slightly convex, the opening vertical, an irregularly inverted Y-shape below, on either side below the mandibles a deep fold. Within the opening the colorless cuticula passes over above, laterally, into the light-yellow mandibles, which are elongate triangular in shape, much reduced in size as compared with other species of this genus, occupying less than the upper half of the sides of the flattened oral tube. The mandibular plates are about twice as long as broad, and are made up of short, slender, slightly-curved, elastic, blunt rods from 2 to 6 μ in diameter, the longest at dorso-anterior margin and decreasing in length behind and below.

Radula large, broad, straight, deeply grooved, the deep amber teeth in 18 rows, of which the last 2 are immature.

Rhachis broad, with 4 series of flattened plates (spurious teeth). The 2 median rows (pl. XIX, fig. 60, *a*) of nearly equilateral rectangular form throughout the whole radula, their length and width being about 0.270 mm. About one-fourth the length of the plate behind its anterior margin it is thickened into a sharply defined transverse cutting ridge of a light-yellow color, contrasting strongly with the grayish remaining portion of the plate. About one-third the length of this ridge, from the inner margin of the plate, a fainter longitudinal ridge, sloping toward the anterior margin, joins it (Pl. XIX, fig. 60, *a*), and in the posterior portion of the radula a similarly placed ridge toward the outer side of the radula may mark off with it a rectangular elevated area (pl. XIX, fig. 61). Margins of the plate irregular, especially the posterior one. In the posterior portion of the radula the region of the plate behind the transverse ridge tends to become convexly thickened in its inner median area (fig. 61). The plates of the outer series (pl. XIX, fig. 60, *b*) of the rhachis are triangular in general shape and of a light-yellow color. The anterior inner angle is sharp and thickened, the other two rounded and thinner. The antero-lateral border is thickened and slopes upward into a strong, rounded, longitudinal elevation, which terminates posteriorly in a heavy, blunt cusp, its apex forming a shoulder on the antero-lateral border just below the anterior angle of the tooth.

Pleuræ (pl. XIX, fig. 62) with 8 strong, large, amber-yellow teeth of similar form, strongly hooked, decreasing in size but little from within outward. In the anterior region of the radula the number may be reduced to 7. The body of each tooth is long, obliquely placed, slightly curved, and twisted at its lower end toward the median line of the radula. The hook is large, directed slightly inward, and flattened dorso-ventrally with a broadly pointed cutting edge. A small, inwardly directed wing-like expansion is borne on the basal portion of the shaft.

Uncini (pl. XIX, fig. 63) prismatic, amber colored, 8 in number, the shape of the first ones much resembling the bodies of the pleuræ with occasional indications of a hook above. The inner 4 of nearly the same size, their length about 300 mm., width about 70 mm., the outer 4 becoming flattened and decreasing rapidly in size, the outermost one being colorless and almost rudimentary. A longitudinal wing-like crest projects toward the median line, often overlapping the adjacent tooth, as in the other species of this genus.

The large lobulated blood gland lies upon the front portion of the anterior genital mass, extending transversely from the median line toward the right side for a distance of 10 mm. It is flattened, thin, and deeply divided into lobules.

Hermaphroditic gland large, concealing the liver; the hermaphroditic duct, narrow at first, after a course of about 8 mm. passes into a very long, more dilated portion, which is coiled in irregular corkscrew-like windings against the inner posterior flattened face of the large hemispherical mass formed by the nidamental and albumen glands. Straightened out this duct measures about 60 mm., a length nearly equal to that of the whole animal. Near the anterior end of the above glands it divides into the the spermatic duct and the oviduct. The spermatic duct passes almost directly into the prostate gland, which is large, slightly flattened, looped closely upon itself, minutely lobulate, and has a total length of about 20 mm. and a maximum diameter of about 3 mm. Leaving the distal end of the prostate gland, the vas deferens, after a short (2 mm.) narrow portion, dilates into the long ampulla. This organ is of a cylindro-conical shape, slightly broader (2 mm.) at its proximal end than at its distal one, about 5 mm. in length, and with thick muscular walls. Beyond the ampulla the duct continues for about 8 mm., dilating gradually and passing into the penis sheath, which is about 6 mm. long by 3 mm. broad. Upon its dorsal surface lies the small, rounded genital ganglion borne upon a branch of the pleural commissure. The glans penis and the distal end of the vas deferens are closely set with minute, erect, claw-like hooks (pl. XIX, fig. 64) for a distance of about 2 mm., becoming more scattered and fewer toward the inner limit of their occurrence. Length of teeth about 42 mm., diameter of base about 12 mm., their tips directed toward the opening of the duct in the completely retracted glans.

The oviduct is as usual in the genus. The very large spermatotheca, about 10 mm. in diameter, occupies nearly the whole of the upper portion of the genital mass; its inner duct is short and receives the short duct of the 5 mm. long, pear-shaped spermatocyst, its distal portion, about 8 mm. long, gradually dilates into the vagina.

The above structural characteristics distinctly mark out this form as a species of *Triopha* totally distinct from the remaining three Pacific coast species. During the summers of 1893 and 1894 it was quite abundant upon the brown kelps, *Nereocystis* and *Macrocystis*, off Point Aulon and Point Pinos. Since then it has been taken at intervals from the same habitat, but in fewer numbers, the large kelp beds having almost entirely disappeared along the coast between Monterey and Pacific Grove. It has never been taken in shore collecting, where *Triopha carpenteri* and *Triopha maculata* are common.

Type no. 181283, U. S. National Museum.

Radulæ of species of Triopha.

	Number of rows.	Number of pleuræ.	Number of uncini.	Authority.
Tr. modesta Bergh	21-28	4-7	10-13	Bergh.
Tr. carpenteri (Stearns)	33	9-18	9-18	MacFarland.
Tr. maculata MacFarland	14	4-5	7-8	Do.
Tr. grandis MacFarland	18	8	8	Do.

Genus 13. POLYCERA Cuvier.

Polycera Cuvier, Regne Anim., 1817, II, p. 390; ed. 2, 1830, III, p. 52.—Bergh, Beitr. zu einer Monographie der Polyceraden, I, Verh. d. k. k. zool.-bot. Ges. Wien, XXIX, 1879, p. 599. System der Nudibr. Gasteropoden, 1892, p. 150.

Body limaciform, nearly smooth; frontal margin digitate; rhinophores nonretractile, clavus perfoliate; branchiæ of few leaves, simply pinnate; upon each side of the branchiæ a single larger digitiform extrabranchial appendage; tentacles short, lobiform.

Mandibular lamellæ with a winglike process above. Radula rather narrow; rhachis naked; lateral teeth 2 large unequal ones and several external ones.

Prostate large. Glans penis armed.

16. Polycera atra MacFarland.

[Pl. XXIX, fig. 22; pl. XX, figs. 65-72; pl. XXI, figs. 105, 111.]

Polycera atra MacFarland, op. cit., p. 50.

Body limaciform, smooth, plump, highest in front of branchiæ, sloping backward to the short, pointed tail. Slightly contracted in front of heart, then somewhat expanded in the slightly flattened head. Head rather high, sloping downward in front, bearing a moderately wide horseshoe-shaped frontal margin carrying 4 slender pointed processes (pl. XXIX, fig. 22). At the sides of the rhinophores this veil is slightly dilated, carries one or two short, pointed, angular processes (pl. XX, fig. 65), and is continued laterally into a more or less elevated dorso-lateral ridge, highest in the region of the branchiæ, where it bears one or two compressed, pointed tubercles, sometimes elongated into short processes (pl. XXIX, fig. 22). The conspicuous lobe of *P. quadrilineata* is here represented by a low tubercle of varying height. Behind the branchiæ these ridges unite in a low median crest to the tip of the tail.

Gill plumes simply pinnate, 8 in number, nonretractile, tallest in front, and decreasing regularly in size from before backward.

Rhinophores stout, nonretractile into sheaths, the stalk conical, the clavus club-shaped, perfoliate, slightly inclined backward.

General body color black (pl. XXIX, fig. 22), dorsum and sides with numerous rows of yellow spots more or less confluent into continuous lines. The intermediate spaces between these yellow spots in longitudinal series is grayish, as are also the basal portion of the frontal veil and the foot. Frontal processes, tips of rhinophores and dorso-lateral tubercles or processes yellow. Branchial plumes with a series of yellow spots, the tips also of the same color. Foot linear, the anterior angles prominent (pl. XX, fig. 65). Tentacles very short, lobiform.

Anal opening at summit of low, cylindrical papilla in center of circle of gill plumes. Renal opening slitlike, at the right and in front of the anal papilla.

Reproductive apertures as usual in the genus, on right side midway between the anterior margin of head and branchiæ, the penis opening rounded, the vaginal and gland openings guarded by a fold of the skin.

Size: Length up to 23 mm., breadth up to 6 mm., height in heart region 7 mm.

Pharyngeal tube short, pharyngeal bulb nearly spherical, very muscular, its length about 3 mm., breadth 3 mm., height 2.5 mm., the strong cutting face of the mandibles projecting in front and above. Mandibles strong, of a light yellow color, the anterior cutting face very oblique, made up of two portions, the ventro-anterior cutting portion and the dorso-lateral arched wings (longitudinal and transverse portions of Bergh's description of *P. quadrilineata*, 1879, p. 606). The cutting portion, of a deep yellowish-brown color, strong and thick, presents an outer arched shieldlike surface which is strongly marked with concentric lines, indicating the laminated structure clearly seen in section, as in figure 68. Upper anterior ends of the cutting portions approximated, rounded, the lower posterior ends divergent and curved backward and upward. Laterally and above the cutting portion is continued into the arched plate (pl. XX, fig. 67, *b*), the anterior margin of which is strongly concave, its superior and posterior margins rounded. The relation of the two plates is best shown in the section, figure 68, taken along the line *a b* of figure 66, from which it is evident that the cutting portion forms the expanded and thickened ventro-anterior border of the dorso-lateral wing. Seen in front view the line of junction of the external face of the wing with the cutting plate forms a clearly defined line, as shown in figure 72, *a*.

Radula rather deeply grooved, of a rich amber color in the posterior teeth, deepening anteriorly to a dark brown. Teeth in 9-10 rows, of which the last one is rudimentary, the halves of the rows of teeth in not exactly a straight line across the radula (pl. XXI, fig 111).

Rhachis naked, not narrow, in width about 0.3 mm.

Pleural teeth 2 (pl. XX, fig. 69; pl. XXI, fig. 111), unequal, the first smaller than the second, alike in shape, the stout shaft flattened, slightly concave upon its inner surface, bearing upon its outer margin a broad triangular winglike expansion directed toward the median line. The lower end of the shaft rounded, the upper end bearing a large smooth-edged hook at right angles to the shaft. Length of first rhachidian tooth 0.300 mm., of second 0.412 mm.

Uncinal teeth 3, triangular prismatic in form, decreasing in length and width from within outward. Each bears a sharp crest upon the upper two-thirds of its inner border, from which the upper surface slopes outward, the inclination decreasing in the second tooth and nearly disappearing in the third. Lower end of the uncini rounded, the upper triangular and sloping inward. Length of first uncinus 0.202 mm., of second 0.165 mm., of third 0.099 mm. Occasionally a rudimentary fourth uncinal tooth may be found (pl. xx, fig. 70), but this is of rare occurrence.

Nervous, vascular, and digestive systems present no striking distinctive characters different from the other species of the group.

Blood gland irregularly lobulate, lying upon aorta at anterior end of the genital mass. About 1 mm. long, 2 mm. wide, and 1 mm. thick in large individuals.

Reproductive system: Ovotestis thin, covering the whole of the liver. Hermaphrodite duct delicate, thin-walled, short, its ampulla not long, its walls thicker, slightly dilated, dividing at anterior face of nidamental gland into spermatic duct and oviduct. Spermatic duct short, looped in close contact with nidamental gland and passing into the large prostate gland, which is made up of a flattened loop of the glandular tube, the whole closely bound together in the form of a concave disk of about 2 mm. diameter, lying upon the anterior face of the spermatotheca. From its anterior end is given off the narrow vas deferens, about 0.2 mm. in diameter and 5 mm. long. No ampulla other than a very slight dilation of the duct is to be found (pl. xxi, fig. 105 *amp*). Glans penis truncately conical, closely set with minute, curved teeth, the largest 8 μ in height by 2.5 μ wide (pl. xx, fig. 71), arranged in rows, the total length of the armature in the retracted glans and the vas deferens together being about 1 mm. Vaginal duct and uterine duct given off from a common duct, about 0.1 mm. long at the outer side of the spermatotheca. The very narrow, thin-walled uterine duct receives the 0.4 mm. long duct of the spermatocyst and doubles its diameter, and after a course of about 3 mm. opens into the spermatotheca, for the last half of its length being closely attached to the vaginal duct. Spermatocyst (pl. xxi, fig. 105 *sp. c.*) ellipsoidal, 1 mm. long, 5 mm. broad, its duct extremely narrow. The spermatotheca (pl. xxi, fig. 105 *sp. th.*) large, about 2 mm. in diameter, spherical, on lower median side of the genital mass forming one-half of its total volume. The vaginal duct, about 5 mm. long and 0.3 mm. in diameter, gradually dilates at its distal end into the vagina.

Habitat: On brown algæ in rocky tide pools from Monterey to Cypress Point. Especially abundant at Point Alones (Chinatown Point). Common.

The structural characteristics of *Polycera atra* clearly separate it from any other species of *Polycera* hitherto described. The low extrabranchial appendages resemble those of *Palio pallida*, described by Bergh (1880) from Alaskan waters, but the coloration, the long frontal processes, the mandibles, radula, and reproductive apparatus are all decidedly different.

Type no. 181278, U. S. National Museum.

Radulæ of species of Polycera and Palio.

Species.	Number of rows.	Number of uncini.	Authority.
P. quadrilineata	15	4	Alder and Hancock.
P. quadrilineata	12-13	4-5	Meyer and Moebius.
P. quadrilineata	14-15	4	Bergh.
P. lessonii	16-18	8	Do.
P. lessonii	13	6	Alder and Hancock.
P. ocellata	16	5	Do.
P. ocellata	13-15	5-7	Meyer and Moebius.
P. pallida	18	5	Bergh.
P. atra	9-10	3-4	MacFarland.

Subfamily XII. GONIODORIDINÆ.

Body oval, more or less depressed, pallial margin strongly prominent; or elongate, sometimes **limaciform,** the dorso-lateral margin sometimes with simple appendages. Rhinophores often with **sheath, retractile** or nonretractile, the clavus perfoliate; branchiæ rarely of few plumes, usually of **many, the plumes** usually simply pinnate, rarely tripinnate, often arranged in horseshoe form. **Tentacles small,** lobiform; the foot usually wide, rarely narrow, rounded in front or with prominent angles.

Pharyngeal bulb supplied on its upper surface with a sessile or petiolated sucking crop (ingluvies). Labial disk covered with simple cuticle or armed with a ring of hooks or mandibular plates. Radula more or less narrow; rhachis naked or occasionally with spurious teeth; pleuræ usually with a single large hooked tooth, occasionally two hooked ones, and with usually few, sometimes many, external teeth.

Glans penis usually armed with a series of hooks.

Genus 14 ACANTHODORIS Gray.

Acanthodoris Gray, Fig. Moll. Animals, IV, 1850, p. 103, Guide Moll. Brit. Mus., 1857, p. 207.—Alder and Hancock, Mon. Brit. Nudibr. Moll., VII, 1855, p. 43; Ap. p. XVII.—G. O. Sars, Moll. Reg. Arct. Norvegiæ, 1878, p. 308.—Bergh, Gattungen nördischer Doriden, Arch. f. Naturgesch., XLV, 1, 1879, p. 356. Nudibr. Moll. North Pac., II, Proc. Acad. Nat. Sci. Phila. 1880, p. 237. Monog. d. Polyceraden, III, Verh. d. k. k. zool.-bot. Gesch. Wien., XXXIII, 1883, p. 170. Malacol. Unters., H. XVII, 1890, p. 988. System der Nudibr. Gasteropoden, 1892, p. 158.

Body soft, subdepressed; notæum thickly covered with short villi; margin of rhinophore aperture lobed; branchial plumes few, tripinnate, arranged in a circle; head wide, veliform, tentacles short, lobiform.

Armature of labial disk of minute hooks, below with projecting thickenings of the cuticle. Radula rather narrow; rhachis naked; first pleural tooth very large, hooked, external pleural teeth few (4–8), smaller. Buccal crop connate with pharyngeal bulb.

Glans penis armed; vagina very long.

17. Acanthodoris hudsoni MacFarland.

[Pl. XX, figs. 73–80.]

Acanthodoris hudsoni MacFarland, op. cit., p. 51.

Body plump, highly arched, slightly higher and broader in front than behind, the general body outline oval. Dorsum soft, villous everywhere, covered by small, thickly set, bluntly conical papillæ (villi), but slightly retractile. Margin of mantle everywhere overlapping the foot except at tip of the tail, its margin broad and rather thick.

General ground color of dorsum and ventral surface clear translucent, yellowish white, or pinkish, the papillæ and branchial plumes tipped with lemon yellow, the mantle edged with the same color.

Length of animal up to 35 mm., breadth up to 22 mm., and height 9 mm.

Head (pl. XX, fig. 73) wide, veliform, the sides prolonged into broad, triangular, pointed tentacles, a wide, rounded notch between them in the median anterior margin of the head. Mouth a small longitudinal slit.

Foot broad, rounded abruptly, and slightly concave in front, the sides very slightly tapering toward the posterior end, where it is less abruptly rounded to the blunt tail.

Rhinophores long, tapering, inclined forward, the clavus recurved and inclining slightly backward. Perfoliate with about 24 leaves, the length of clavus and stalk nearly the same, about 5 mm., the whole organ 10 mm. long with a basal diameter of 2 mm. Retractile into a low sheath, the margin of which bears numerous short papillæ similar to those of the dorsum.

Branchial plumes 5, bipinnate, nonretractile within sheath, widespreading, arranged in a circle inclosing the anal papilla and numerous slender papillæ similar to those of the general dorsum. Anal opening at the summit of a low blunt papilla, connate to the sides of which are 3–5 slender-pointed processes forming ridgelike lateral elevations and extending beyond the summit. Pseudoperitoneum sparsely sprinkled anteriorly with fine dark flecks. Blood gland elliptical, light colored, disk-like, about 1 mm. long by 1.5 mm. wide and 0.5 mm. thick, lying transversely above the central nervous system.

Pharyngeal bulb 2 mm. long, 2.5 mm. high (including crop), and 1.3 mm. in width. The crop conspicuous, hemispherical, with a narrow median longitudinal muscular band, the sides ridged with muscular bands converging toward the under portion, its walls very thick. The radula sheath projecting behind and below for 0.5 mm. No conspicuous esophageal diverticulum at anterior end of the esophagus as in *A. brunnea* from the same locality.

Labial disk oval, convex, about 0.9 mm. in diameter; its cuticle thin and colorless. The light yellow armature (pl. xx, fig. 74) a pavement of minute hooks (pl. xx, fig. 79) confined mainly to a triangular area on the lower and lateral borders of the opening. The lowermost portion of the labial armature is free from hooks and is occupied by a broad, slightly concave thickening of the cuticle, narrowing to a point posteriorly and anteriorly forked, divergent into two bladelike processes which project freely a short distance from the margin (pl. xx, figs. 75, 76), the whole structure being shaped much like an arrowhead, the point directed backward and extending into the colorless cuticle lining the entrance to the pharyngeal bulb, its total length 0.288 mm.

Radula very narrow, with a deep U-shaped groove. Teeth in 27 rows, the last 3 rudimentary. Rhachis very narrow, naked. First pleural tooth (pl. xx, fig. 77) very large, upright, compressed, its base quadrangular in lateral outline, the posterior border thin and overlapping the outer anterior margin of the first pleural tooth of the succeeding row. Lower portion of the base rounded in front, strongly thickened. Height of base about 0.210 mm., its length 0.114 mm. The anterior portion prolonged upward into a strong slightly curved hook about 0.180 mm. in length, upon the inner margin of which is a series of 5–7 denticles midway of its length, decreasing rather irregularly in size from above downward. In the older, more anterior teeth of the radula, the number of denticles is occasionally increased to 10–11, the lowest 4–5 being extremely small. Length of the largest denticles about 0.008 mm.

The remaining pleuræ, 5–6 in number, are small and of nearly the same size, oblique, the basal portion thickened, the upper margin portion prolonged posteriorly into a slightly flattened, bluntly pointed hook with a thin, keellike plate below, the general shape resembling that of the first pleural tooth (pl. xx, fig. 78). Average length 0.05 mm.

Hermaphroditic gland very thin, covering nearly all of the liver, its duct thin walled, slender, about 0.6 mm. long by 0.1 mm. broad, arising from the right anterior lobe of the visceral mass near the median line and passing in a short loop into its dilated ampulla. Anterior genital mass small, plano-convex, its superior border occupied by the glandular portion of the vaginal duct, the spermatotheca, and the spermatocyst, its inner flattened face by the loops of the ampulla of the hermaphroditic duct, its outer convex face formed by the nidamental and albumin glands. The ampulla of the hermaphroditic duct describes a short loop upon the inner face of the nidamental gland, passes forward and upward, describing almost a complete circle, gives off the spermatic duct, and passes at once into the nidamental gland. Length of ampulla 3 mm., its diameter 0.5 mm.

The spermatic duct describes an 8-shaped loop closely attached to the anterior margin of the genital mass, passes backward in a long free loop underneath the anterior end of the visceral mass near the median line, returns upon itself, and passes into the penis. Total length about 8.5 mm., diameter 0.2 mm. Penis cylindro-conical, 1 mm. long by 0.4 mm. wide, the retracted glans bluntly conical, armed with very minute hooks, occupying nearly the whole length of the hollow preputium.

The uterine duct (pl. xx., fig. 80, *u. d.*) is very slender and short, passing directly from the anterior inner margin of the nidamental gland to its superior margin, where it receives the slightly wider duct of the pear-shaped spermatocyst (0.5 mm. long) (pl. xx, fig. 80, *sp. c.*), and passes immediately into the spermatotheca. The spermatotheca (pl xx, fig. 80, *sp. th.*) is small, about 1 mm. in diameter, spherical, and concealed entirely by the overlying portion of the vaginal duct. The total length of the vaginal duct is about 7 mm., its proximal portion describing an S-shaped loop (pl. xx, fig. 80, *a.*), and dilating rapidly into the glandular portion (pl. xx, fig. 80, *gl.*). This glandular part is thickened; its walls of large gland cells, the lumen narrow; its total length about 1.2 mm. Its external surface bears 4 equidistant longitudinal grooves, and the intermediate portions are transversely lobulated at intervals, the general outline in cross-section being that of a quatrefoil. The distal portion of the vaginal duct is nearly straight, about 4 mm. in length, and passes over insensibly into the vagina (pl. xx, fig. 80, *v. d.*).

Habitat: Tide pools at extreme low water, near Point Pinos. Rare, but 4 specimens of this interesting species having been taken.

Acanthodoris hudsoni differs markedly in the details of its radula armature, and also in the reproductive system, from any other species of this genus, especially from the forms recorded thus far from the Pacific coast. Bergh (1880) has described *Ac. pilosa* var. *albescens*, and *Ac. pilosa* var. *purpurea*, together with a new species, *Ac. cœrulescens* from Alaska. These are all strikingly different from *Ac.*

hudsoni and the following form here described, which are the only ones of this genus yet taken from Monterey Bay or its vicinity.

The specific name here given is in recognition of the masterly work of my friend Mr. Charles B. Hudson in the illustration of various animal forms.

Type no. 181289, U. S. National Museum.

18. Acanthodoris brunnea MacFarland.

[Pl. XXIX, figs. 20, 21; pl. XX, figs. 81-88a; pl. XXI, fig. 104.]

Acanthodoris brunnea MacFarland, op. cit. p. 52.

Body outline oval, convex, broadest in front about in the region of the rhinophores, the mantle firm and thickly set everywhere with conical tubercules having rounded tips (Pl. XXIX, figs. 21, 20.) Tubercules of varying size and of no definite arrangement save that the smaller ones almost invariably alternate with the larger (about 1 mm. in diameter). Mantle everywhere covering the foot except posteriorly when the animal is in motion, its margin broad and rather thick. General color of dorsum brown, flecked with irregular blotches of black in varying amount (pl. XXIX, fig. 21). Between the tubercules numerous small spots of light lemon yellow, the mantle edged more or less completely with the same color. Stalks of branchial plumes yellowish brown, marked on the inner side with two narrow longitudinal lines of dark brown, the branchiæ tipped with lemon yellow. Rhinophores deep blue-black, tipped with yellowish white. In alcoholic specimens the general darker color is well retained, the yellow tending to disappear.

Total length of animal 19-22 mm., width 9-15 mm., height 7-9 mm.

Head large, veliform, concealed by mantle (pl. XXIX, fig. 21), continued laterally into the wide flat tentacles, in front with a slight median concavity. Tentacles broad, recurved, bluntly pointed at tips, their anterior curved margin thin. Mouth a longitudinal slit. Foot oval, nearly quadrangular, its anterior and posterior ends bluntly rounded. General color of under surface yellow, the lower face of mantle, the head, tentacles and sides of body sprinkled with fine dark brown or black dots.

Rhinophores long, cylindro-conical, tapering to blunt tips, inclined forward and outward, perfoliate with 20-28 thin, slightly oblique laminæ, the lower ones occupying the front of the clavus only (pl. XXI, fig. 104). Stalk one-half the length of the laminate portion. Color deep blue-black, tipped with yellowish white, the laminæ edged with a very narrow line of white, not noticeable without a hand lens. Fully extended length, 8.5 mm. Retractile within a low sheath, the margin of which is prolonged into 6-8 lobes resembling the dorsal tubercules, but somewhat flattened. Three of these are as high as the dorsal tubercules and are placed at equidistant intervals, one external, the other two antero-median and postero-median, respectively, the intervals between them being occupied by lower similar ones (pl. XXI, fig. 104).

Branchial plumes 7, wide spreading, bipinnate, nonretractile within a sheath, arranged in an incomplete circle about the anal papilla on posterior dorsum. About 10 tubercules are included within the rosette, 4-5 of them large and inclosing the anal papilla, which is about one-half the height of the largest tubercules, and is edged with a narrow line of yellow.

Pseudo-peritoneum thickly sprinkled with fine black pigment. Blood gland lobulated, white, placed transversely upon the central nervous system, overlapping in front the large proximal convoluted portion of the salivary glands, which is coiled at the sides and upon the small œsophageal diverticulum.

The pharyngeal bulb is strong, its height, including the crop, is 3 mm., length 2.3 mm., width 2 mm., the radula sheath projecting behind and below for 1 mm. Crop large, spherical, constricted longitudinally into two symmetrical halves about 2 mm. long by 3 mm. wide. The sides are ridged laterally by the converging muscles to the lower anterior portion, the walls very thick and muscular. Base of crop joined directly to the dorsal portion of the pharyngeal bulb, with no trace of a petiole. Labial disc round, convex, its light brown cuticle radially striated, the opening elongate, slit-like, the ends dilated. The labial armature is made up of a band of mosaic-like plates, about 0.240 mm. in width, incomplete above. Each plate is in the form of a minute erect hook, its apex directed outward, either pointed or blunt sometimes bifid (pl. XX, fig. 83). Height of a typical labial element, 0.007 mm. At the lower margin of the labial armature (pl. XX, fig. 81) a single flattened plate-like concave thickening of the cuticle projects freely forward for 0.082 mm., its width 0.033 mm. at the base, the free end about 0.05 mm., with a total length of about 0.270 mm., blunt and jagged as though broken off, its proximal portion extending across the whole band and interrupting the continuity of the hooks below (pl. xx, fig. 82).

Radula narrow, deeply grooved, the teeth in 24–28 rows, the last two of which are rudimentary. The oldest teeth colorless, those toward the posterior end of the radula light yellow.

Rhachis very narrow, naked. First pleural tooth (pl. xx, fig. 84) large, upright, compressed, its base quadrangular in lateral outline and overlapping the outer anterior margin of the first pleural of the following row. Lower portion of the base strongly thickened, upon its upper posterior border a squarish thickened shoulder directed obliquely upward. Height of base about 0.192 mm., its length 0.066 mm. The anterior portion of the base is prolonged upward into a strong, slightly curved hook about 0.150 mm. in length, upon the inner border of which is a series of 14–19 denticles, the longest being 0.012 mm. in length. The remaining pleuræ, 6–7 in number, are small, borne obliquely on the radula, and decrease regularly in size outward. The first of the outer plates (pl. xx, figs. 85, 86) are depressed, flattened above, bluntly pointed behind and have a thin, keel-like plate below, the general shape being somewhat similar to that of the first pleural tooth; the outermost ones are reduced to mere flattened plates (pl. xx, fig. 87).

The anterior genital mass is small, plano-convex, its flattened face directed inward and upward, somewhat oval in shape, with a long diameter of about 4 mm. The hermaphrodite duct is short and very narrow, dilating almost immediately into its whitish ampulla (pl. xx, fig. 88, *h. amp.*) of about 0.5 mm. diameter, with a length of about 6 mm. The ampulla describes an S-formed loop upon the plane face of the anterior genital mass, its lower turn coursing forward and upward along the anterior margin of the nidamental gland, entering into it and dividing into the oviduct and the spermatic duct. The uterine duct (pl. xx, fig. 88, 88*a*, *u. d.*), emerging from the gland, narrows rapidly in passing upward to the superior border of the genital mass, receives the short duct of the pear-shaped spermatocyst, 0.4 mm. long by 0.3 mm. wide (pl. xx, fig. 88*a*, *sp. c.*), and passes into the spermatotheca. The spermatotheca (pl. xx, fig. 88, 88*a*, *sp. th.*) is spherical, about 1 mm. in diameter, with a very short common duct receiving the uterine duct and the vaginal duct. The latter (fig. 88, 88*a*, *vag.*), together with the vagina, is not more than 6 mm. long, much shorter than in any other species of this genus yet described, its diameter gradually increasing from 0.3 mm. to 0.8 mm. and passing without definite boundary into the vagina.

The spermatic duct is very long and much convoluted, its loops lying at the anterior border of the genital mass. The first 9 mm. of its length are closely bound down to the genital mass by connective tissue, have an average diameter of 0.8 mm., and are sharply marked off from the succeeding slenderer portion, which describes a large loop free from close connection with the remainder of the organs. This muscular portion is 0.2 mm. in diameter with a length of 9 mm., the total length of the whole duct thus being 18 mm. It enlarges rapidly at its distal end and passes into the thicker cylindro-conical penis, 3 mm. in length by 1 mm. in average diameter. In the specimens dissected a part of the distal end of the glans was missing, and hence the armature of hooks could not be made out satisfactorily.

Habitat: Dredged off hard sandy bottom in about 10–20 meters depth near entrance to Monterey Harbor. Twelve specimens were taken in two dredge hauls in 1894, and an occasional specimen has been dredged since then near the same locality. Type no. 181293, U. S. National Museum.

Genus 15. ANCULA Lovén.

Ancula Lovén, Index Moll. Scand., p. 5, 1846.—Alder and Hancock, Monog. Brit. Nudibr., III, 1846, Fam. 1, pl. 25; VI, 1854, Fam. 1, pl. 17, fig. 7–8; VII, 1855, pl. 46, Sup. fig. 22; Appendix 1855, p. xviii.—Meyer and Moebius, Fauna der Kieler Bucht, I, 1865, p. 59.—G. O. Sars, Moll. reg. arct. Norv., 1878, p. 364.—Bergh, Beitr. z. Monogr. der Polyceraden, II, 1880, p. 3. System der Nudibr. Gasteropoden, 1892, p. 164.

Body limaciform, smooth; scarcely any frontal veil; rhinophores nonretractile, with two anterior linear basal appendages; branchial plumes 3, tripinnate, with several simple extrabranchial appendages; head small, tentacles rather short, lobiform, somewhat flattened; foot narrow, rounded in front.

Labial armature made up of rows of separate imbricated hooks. Radula narrow, the rhachis naked; first pleural tooth large and broad, its inner margin denticulate, the remaining one much smaller, subtriangular. Buccal crop sessile.

Glans penis armed.

19. Ancula pacifica MacFarland.

[Pl. xxx, fig. 23; pl. xx, figs. 89–92; pl. xxi, figs. 93–96.]

Ancula pacifica MacFarland, op. cit., p. 53.

Body slightly compressed, smooth, limaciform, highest in front of the branchiæ, tapering posteriorly to the tip of the long pointed tail, anteriorly sloping less rapidly to the high rounded head (pl. xxx, fig. 23). General color clear, translucent yellowish white, a narrow median line of orange on dorsum extending from between the rhinophores to the branchiæ, and continued behind the branchial plumes along a slight crest to the tip of the tail. Upon each side along the indistinct dorso-lateral margin a similar orange line extending from the rhinophores to the extrabranchial appendages, continued between their bases and prolonged for a very short distance behind the last one.

Head (pl. xx, fig. 89) bluntly rounded, no frontal veil, the tentacles short, slender, blunt, and slightly flattened.

Rhinophores nonretractile, large, the clavus perfoliate, with 9 yellowish leaves, which are oblique behind and horizontal in front. The stalk of the rhinophores as long as the clavus, cylindro-conical, its base with two long finger-like processes nearly as long as the whole rhinophore, directed obliquely forward and outward, tipped with orange. The distal end of the rhinophore projects beyond the clavus as a slightly enlarged truncate cylinder (pl. xxx, fig. 23).

Branchial plumes 3, nearly equal in size, bipinnate, in part tripinnate, nonretractile within sheaths, a single median anterior plume and a lateral one on each side, the main subdivisions tipped with orange. Immediately behind the bases of the plumes and free from them is the small cylindrical anal papilla, the renal pore situated near its base on the right side and in front. Borne on the dorso-lateral margin on each side of the branchial plumes are 4 blunt, club-shaped processes, dilated above, contracted at the base, the upper third of each light yellow, tipped with orange. In one individual the number of these extrabranchial appendages was reduced to 3 on each side.

Foot narrow, the sides nearly parallel, tapering posteriorly to the tip of the slender tail, the anterior end abruptly rounded.

Dimensions of the largest individual taken: Length 16 mm., breadth 2 mm., height 3.5 mm.

Pharyngeal tube very short, pharyngeal bulb small, 1.5 mm. long by 1.5 mm. high, inclusive of crop, and 1 mm. broad, the sucking crop spherical, prominent, connate.

Labial disk convex, nearly circular, armed with a strong spinous armature, the "prehensile collar" of Alder and Hancock, broadest below (0.150 mm.), narrowing laterally and incomplete above. The elements of the armature (pl. xx, fig. 90) are light yellow in color and arranged radially with 3–6 plates in each row in the lower part. The fundamental shape of these elements is the same, a broad curved base with posterior bifid extremity, in front rounded, the upper surface arched and gradually rising into a blunt hook directed outward. The innermost teeth have strongly curved bases, the outer ones less so, the outermost teeth smallest. Toward the upper part of the ring the teeth become very small, are reduced to the innermost row and have the hook directed sharply outward (pl. xx, fig. 91); the larger ones below are less oblique. The distal end of the hook is minutely serrulate, the denticles thus formed being much smaller and more numerous than in *A. cristata* (4–5, Bergh). The largest plates of the labial armature measure about 0.252 mm. in length, the tip of the hook 0.012–0.015 mm. wide.

Radula narrow, colorless, the teeth in 35 rows increasing in size markedly from front to back of radula, the most posterior teeth being twice the size of the most anterior ones.

Rhachis narrow, bearing a single quadrangular median plate, slightly broader behind than in front (pl. xx, fig. 92) and occasionally giving indications of being made up by the fusion of a pair of plates in the median line. In the first 8–10 rows of the radula these median plates are absent, but are constant in the remaining portion. They are not produced artificially by the breaking off of the basal portion of the first pleuræ as indicated by Bergh for *A. cristata* (1880, l. c.). Length of average median plate 0.018 mm., its width 0.012 mm.

The pleural teeth are 2 in number, the first one large, with an irregular transverse base and a concave, triangular vertical body placed slightly oblique to the median line of the radula. The inner margin is thickened, bears 11–17 recurved sharp denticles, and terminates above in a strong hook (pl. xxi, fig. 93). The height of a first pleural tooth from the middle region of the radula is 0.084 mm.

The second pleural teeth are triangular, thicker below, thin above, terminating in a strong apical hook.

Glans penis (retracted) with an armature of extremely small hooks along its canal for 0.6 mm., in about 15 rows, the individual hooks 0.004 mm. high.

Habitat: On hydroids and bryozoa in tide pools near Pacific Grove; rare. But eight individuals have thus far been taken. Graceful and slow in movement, rather active in confinement, frequently swimming at the surface.

Type no. 181280, U. S. National Museum.

Genus 16. HOPKINSIA MacFarland.

Hopkinsia MacFarland, op. cit., p. 53.

Form of body elongate-oval, very much depressed; the notæum thickly set with long papillæ, simple or occasionally forked; pallial margin not set off from the sides of the body but sloping gradually down into the foot without any distinct boundary, anteriorly continued into a broad velar expansion formed by the fusion of the labial tentacles in front; rhinophores nonretractile, perfoliate, branchiæ several, separate, simply pinnate plumes, arranged in a horseshoe-shaped arc; the foot broad, its margin thin, undulating, in front deeply emarginate, behind forming a short, broad, blunt tail. Head broad, its tentacles very broad and thin, auriculate at the outer posterior angles, in front united into a veil with undulating margin.

Labial armature a ring of very short, thickened rods.

Radula very narrow, the rhachis naked; the first pleural tooth long, erect, hooked, the outer one flattened, horizontal, denticulate.

The genus *Hopkinsia* is perhaps more closely related to *Idalia* than to any other of the Goniodoridinæ. That it forms a valid genus distinct from the latter I have not the slightest doubt, having compared the Mediterranean representatives of *Idalia* with it in detail. As to external features a comparison of figures 24 and 25 of plate XIV with the excellent figures of Alder and Hancock (Monog. Brit. Nudibr. Moll., Fam. I, pls. 26 and 27) or of Bergh (Ueber die Gattung Idalia, Arch. f. Naturgesch. XLVII, 1, 1881, pl. VIII, figs. 1 and 2) shows most striking differences in the general body form which serve to distinguish the genera at sight. The body is very low, not high; the dorsum wide, not narrow; the sides of the body very gently inclined, not abruptly sloping; the pallial margin indistinguishable, not conspicuous; the tail short and rounded, not long and lanceolate; the dorsal papillæ and the undulating marginal veil of the head and modified tentacles are all different. Details of the internal anatomy, notably the pharyngeal and reproductive apparatus, strengthen the conclusion. In an extended morphological study of this genus, which I have in preparation, I hope to take up the question of its relationships in detail.

This new genus is dedicated to Mr. Timothy Hopkins, through whose generous appreciation the foundation of the Hopkins Seaside Laboratory was rendered possible. The type of the genus is the following species.

20. Hopkinsia rosacea MacFarland.

[Pl. XXXI, figs. 24, 25; pl. XXI, figs. 97–103.]

Hopkinsia rosacea MacFarland, op. cit., p. 54.

General body outline elongate-elliptical (pl. XXXI, fig. 24), sometimes elongate-oval or almost quadrangular (pl. XXXI, fig. 25), the ends abruptly rounded. Body firm, fragile, the many spicules rendering it almost calcareous, much depressed, the dorsum but slightly arched above and sloping gradually outward to the thin margin of the foot, there being no trace of a pallial margin nor ridge marking the boundary between back and sides.

Foot (pl. XXXI, fig. 25) broad, abruptly rounded behind into a broad and short tail, in front deeply incised by a broad, triangular notch, the margins of which are slightly thickened, the remaining margin of foot and tail thin and undulating.

Head broad, its tentacles very broad, united in front, forming a veil-like expansion with undulating margin, the rounded posterior angles slightly auriculate and free from the anterior outer margin of the foot for but a short distance. The mouth a longitudinal slit.

Dorsum thickly set everywhere with long, gently tapering, soft papillæ (pl. XXXI, fig. 24), many reaching a length of one-half to two-thirds that of the whole animal. The tips of these papillæ are usually pointed and simple, but in nearly every individual branching forms may be found. The branching may be limited to a bifid apex, or the branch may arise along the side. In many cases this branching is due to a fusion of two or more papillæ (pl. XXI, fig. 97). Papillæ most abundant on lateral

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portions of dorsum and in front of rhinophores, more sparsely scattered on the mid-dorsal region (pl. xxxi, fig. 24).

Rhinophores perfoliate, cylindro-conical, nonretractile within sheaths, of which no trace is present. Thickest below, the smooth, tapering shaft passing gently upward into the conical clavus (pl. xxi, fig. 98). In front the rhachis of the clavus is smooth, behind and laterally are borne about 20 slightly oblique plates, the pairs meeting behind at a very obtuse angle. The upper plates extend farther around the clavus than the lower ones, the extent on the sides and in front decreasing regularly from above downward, the lowest being but slight posterior ridges. Clavus nearly three-fourths the total length of the rhinophore, the whole organ not being as long as the surrounding dorsal papillæ.

Branchial plumes 7–14, entirely separate at the bases, arranged in a wide semicircle or arc approaching horseshoe form, the ends directed obliquely backward (pl. xxxi, fig. 24). The plumes are nearly erect, simply pinnate and free from spicules.

Anal opening small, inconspicuous, situated at the center of the arc of branchiæ. Renal opening very minute, rounded, situated at the right and slightly in front of the anal opening and about 1 mm. distant from it.

Reproductive openings inconspicuous, on right side far forward, on a line with the bases of the rhinophores, immediately below the outermost row of papillæ.

Color everywhere a beautiful deep rose pink (pl. xxxi, fig. 24).

Length of large individual 26 mm., width 16 mm., and height of body alone 5 mm. Length of longest dorsal papillæ 18 mm.

In alcoholic material the pseudo-peritoneum is white, in living specimens slightly pinkish. The blood gland is single, large, broad, and thin, in general outline quadrangular. It fits closely in behind the central nervous system, extending down in lobules between the underlying organs. Length 3 mm., width 2 mm.

The pharyngeal bulb is short and thick, being about 2.4 mm. in length by 2 mm. in width and the same in height, or, including the sucking crop, 3 mm. in height. At the lower posterior border the radula sac projects as a slightly curved, cylindrical process with rounded extremity for a distance of about 1.5 mm. On the dorsal surface of the pharyngeal bulb is borne a strong ellipsoidal sucking crop, 2 mm. long, 1.5 mm. wide and 1.5 to 2 mm. high, attached at its extreme anterior end by a very short narrow petiole. Its walls are very thick and muscular and are lined with a strong cuticula.

The labial disc has a thick cuticula bearing a ring of short thickened rodlets in very close arrangement (pl. xxi, fig. 99). The rodlets are circular to elliptical in outline, narrowest at the outer and inner margins and increasing in width toward the middle of the band. Width of the labial armature 0.4 mm., diameter of widest rods 0.01 mm.

Radula narrow, the teeth in 16 rows. Rhachis extremely narrow, naked. Pleural tooth (pl. xxi, figs. 100, 101) large, erect, long, flattened, its base triangular, broad, thickened above, in length one-third to one-half that of the whole tooth, the shaft flattened, blade-like, in cross section the shape of a saber blade, its posterior border straight, beveled, sharp, the anterior border thickened, curved and rounded; at the distal end is borne a small posteriorly curved blunt hook. In the older teeth of the anterior end of the radula this hook is often broken off (fig. 100) and the whole tooth is more slender than those from the posterior portion (figs. 100, *a*, 101). Total length of average pleural tooth 0.63 mm., length of blade 0.339 mm., length of hook 0.036 mm. The single uncinal tooth (pl. xxi, figs. 100, *c*, 102) is much smaller, thin, depressed, nearly horizontal, triangular in form, the anterior lower edge emarginate, the posterior one more or less pointed and often divided into a series of irregular denticles (fig. 102). This tooth is quite variable in form and is easily overlooked. Length 0.080 to 0.098 mm., greatest width 0.076 mm.

Esophagus narrow, about 0.5 mm. in diameter by 5 mm. in length, passing obliquely downward and backward in the median line to the anterior lower end of the visceral mass, where it dilates into the stomach, which is almost entirely inclosed by the liver, into which it sends numerous large diverticula. The pyloric end narrows into the intestine at the anterior upper end of the visceral mass, which describes an abrupt loop forward to the right in contact with the superior surface of the anterior genital mass, and then courses directly backward to the anus as a thin-walled tube, 1 mm. in diameter at its anterior end and rapidly tapering to a diameter of 0.5 mm. for the greater part of its total length of about 10 mm.

The liver is about 7 mm. long by 3 mm. wide by 25 mm. high, depressed, its upper face convex, the lower flattened, the posterior end slightly conical, rounded, the upper anterior margin occupied by the loop of the stomach. Its whole anterior and nearly all of the lateral faces are closely invested by the pink hermaphroditic gland with its thick pinkish lobules.

The narrow hermaphroditic duct passes obliquely downward from the upper anterior border of the ovotestis for a distance of about 2.5 mm., with a diameter of 0.4 mm., dilating into the large sausage-shaped ampulla. The silvery gray hermaphroditic ampulla (pl. XXI, fig. 103, *amp.*) lies upon the upper and central portion of the anterior genital mass, extending forward to its anterior end, is 3 mm. in length, and has a maximum diameter of 1 mm. At the anterior margin it divides into the spermatic duct and the oviduct, the first of which passes immediately into the enormous white prostate gland (pl. XXI, fig. 103, *pr. gl.*) overlying the whole inner face of the anterior genital mass and forming fully one-half of its bulk. The prostate gland describes a loop backward and then doubles forward in a broad flattened dilation of 4 mm. in length by 2.5 mm. in width, its distal anterior end giving origin to the narrow vas deferens (fig. 103, *v. d.*), which, after a short irregularly coiled portion, passes directly outward and forward into the penis. The retracted penis (fig. 103, *p.*) is about 2 mm. long, its distal end (the glands) bluntly conical, 0.3 mm. in length, and bearing an armature of minute hooks in the last 0.24 mm. of its canal. The oviduct passes directly into the anterior margin of the nidamental gland, and close to its point of entrance appears the uterine duct (fig. 103, *u. d.*), about 0.2 mm. in diameter, coursing backward for 2.5 mm. into the spermatotheca, receiving the slender duct of the spermatocyst just before entering it. The spermatocyst (fig. 103, *sp. c.*) is small, elongate-oval, 1 mm. long by 0.5 mm. broad, and lies upon the mid-dorsal surface of the genital mass at the anterior border of the spermatotheca. Its duct is very slender, being but slightly longer than the cyst itself. The spermatotheca (fig. 103, *sp. th.*) is voluminous, flattened, spherical in form and about 2.3 mm. in diameter, and occupies the upper posterior face of the anterior genital mass. At its anterior face it receives the uterine duct and gives off the vaginal duct very close to its entrance. The latter is a narrow, nearly straight tube about 3 mm. long by 0.2 mm. in diameter, which courses obliquely outward and forward to the short vagina (fig. 103, *vag.*), which is nothing more than its dilated outer extremity.

This beautiful species has been observed at all times of the year, in about equal numbers, under shelving stones between tide marks all along the coast from Monterey to Point Lobos. It has also been taken by Prof. T. D. A. Cockerell at San Pedro. The eggs are laid in the usual spiral form, the band being narrow and of the same color as the animal. The brief summary of its morphological characteristics here given is amply sufficient to show its nonconformity to any of the genera of Goniodoridinæ as yet described. A more complete study of the genus is in preparation.

Type no. 181275, U. S. National Museum.

Family E. CORAMBIDÆ.

Corambidæ Bergh, Syst. d. Nudibr. Moll., p. 165, 1892.

Body doridiform, oval, depressed. Notæum somewhat convex; perinotæum wide, flattened, rounded in front, deeply incised in the median line behind, everywhere projecting beyond the foot. Rhinophores retractile into sheaths, the posterior side of which is longitudinally cleft; the clavus cylindrical, simple, bearing a wing on each side—somewhat rolled backward. Branchiæ of few, separate, simply pinnate leaves on the under side of the posterior mantle margin on each side. Anus postero-median between perinotæum and foot, the renal pore above and at its right. Head concealed by mantle, small, produced laterally into triangular tentacles. Sides of the body very low; on the right anterior side the genital papilla with three openings. Foot narrower than the back, rather wide, emarginate in front, rounded behind.

Pharyngeal bulb with two prominent ridges below in the buccal cavity. Radula rather narrow; the rhachis naked; pleuræ with a larger denticulate tooth and a few (4) external hooked teeth. Buccal crop connate to the pharyngeal bulb.

Glans penis unarmed. (?)

Family F. DORIDOXIDÆ.

Doridoxidæ Bergh, The Danish Ingolf Expedition, II, no. 3, 1900, p. 15.

Form of body as in Dorididæ, but without dorsal branchiæ and with laterally placed anus. Rhinophores as in Dorididæ.

Pharyngeal bulb strong, mandibles very strong. Radula with a large median tooth, pleuræ multi-dentate.

PLATE XVIII.

Archidoris montereyensis (Cooper) Bergh.

FIG. 1.—Outer pleuræ of fourteenth row. × 120. (Camera lucida.)
FIG. 2.—Inner pleuræ of eighth row. × 120. (Cam.)
FIG. 3.—Inner face of twelfth pleural tooth of fourth row. × 120. (Cam.)
FIG. 4.—*v. d.*, vaginal duct; *sp. th.*, spermatotheca; *sp. c.*, spermatocyst; *u. d.*, uterine duct. × 10. (Cam.)
FIG. 5.—Ventral view of anterior end of animal, life size.

Anisodoris nobilis (MacFarland).

FIG. 6.—Ventral view of anterior end of animal, life size.
FIG. 7.—Outer pleuræ. × 83. (Cam.)
FIG. 8.—Pleuræ from middle of row. × 52. (Cam.)
FIG. 9.—Inner pleuræ of eleventh row. × 83. (Cam.)
FIG. 10.—Outer face of innermost pleural tooth of seventh row. × 83. (Cam.)
FIG. 11.—Inner face of large pleural tooth from middle of row. × 52. (Cam.)

Discodoris heathi MacFarland.

FIG. 12.—Ventral view of anterior end of animal. × 4.
FIG. 13.—Inner pleuræ of thirteenth and fourteenth rows. × 146. (Cam.)
FIG. 14.—Inner face of typical pleural tooth. × 83. (Cam.)
FIG. 15.—Labial armature flattened out. × 30. (Cam.)
FIG. 16.—*v. def.*, vas deferens; *pr.*, prostate gland; *sp. d.*, spermatic duct; *ov.*, oviduct; *h. a.*, hermaphroditic ampulla; *h. d.*, hermaphroditic duct.
FIG. 17.—*vag. d.*, vaginal duct; *sp. th.*, spermatotheca; *sp. c.*, spermatocyst; *u. d.*, uterine duct.

Rostanga pulchra MacFarland.

FIG. 18.—Inner pleuræ of 3 rows slightly displaced. *a*, innermost pleural tooth. × 400. (Cam.)
FIG. 19.—Isolated pleural teeth seen at various angles. × 400. (Cam.)
FIG. 20.—Outer pleural teeth. *a*, thirtieth tooth; *b*, front view of an outer tooth; *c*, *d*, *f*, distal ends, and *e*, side view of outermost teeth in row. × 400. (Cam.)
FIG. 21.—Labial armature from above. *a*, anterior margin. × 400. (Cam.)

Diaulula sandiegensis (Cooper).

FIG. 22.—Five innermost pleuræ. × 83. (Cam.)
FIG. 23.—Six outermost pleuræ. × 83. (Cam.)
FIG. 24.—Front view of pleural tooth from middle of row. × 120. (Cam.)

Aldisa sanguinea (Cooper).

FIG. 25.—Bases of nineteenth to thirty-second pleural teeth. × 120. (Cam.)
FIG. 26.—*a*, distal end of thirteenth pleural tooth; *b*, basal ends of four pleural teeth. × 146. (Cam.)

Cadlina marginata MacFarland.

FIG. 27.—Hooks of labial armature. × 400. (Cam.)
FIG. 28.—*a*, rhachidian tooth; *b*, first pleural teeth of nineteenth row. × 400. (Cam.)
FIG. 29.—Twelfth pleural tooth. × 400. (Cam.)
FIG. 30.—Outermost pleuræ. × 400. (Cam.)
FIG. 31.—Outermost pleuræ, fifty-third row. × 400. (Cam.)

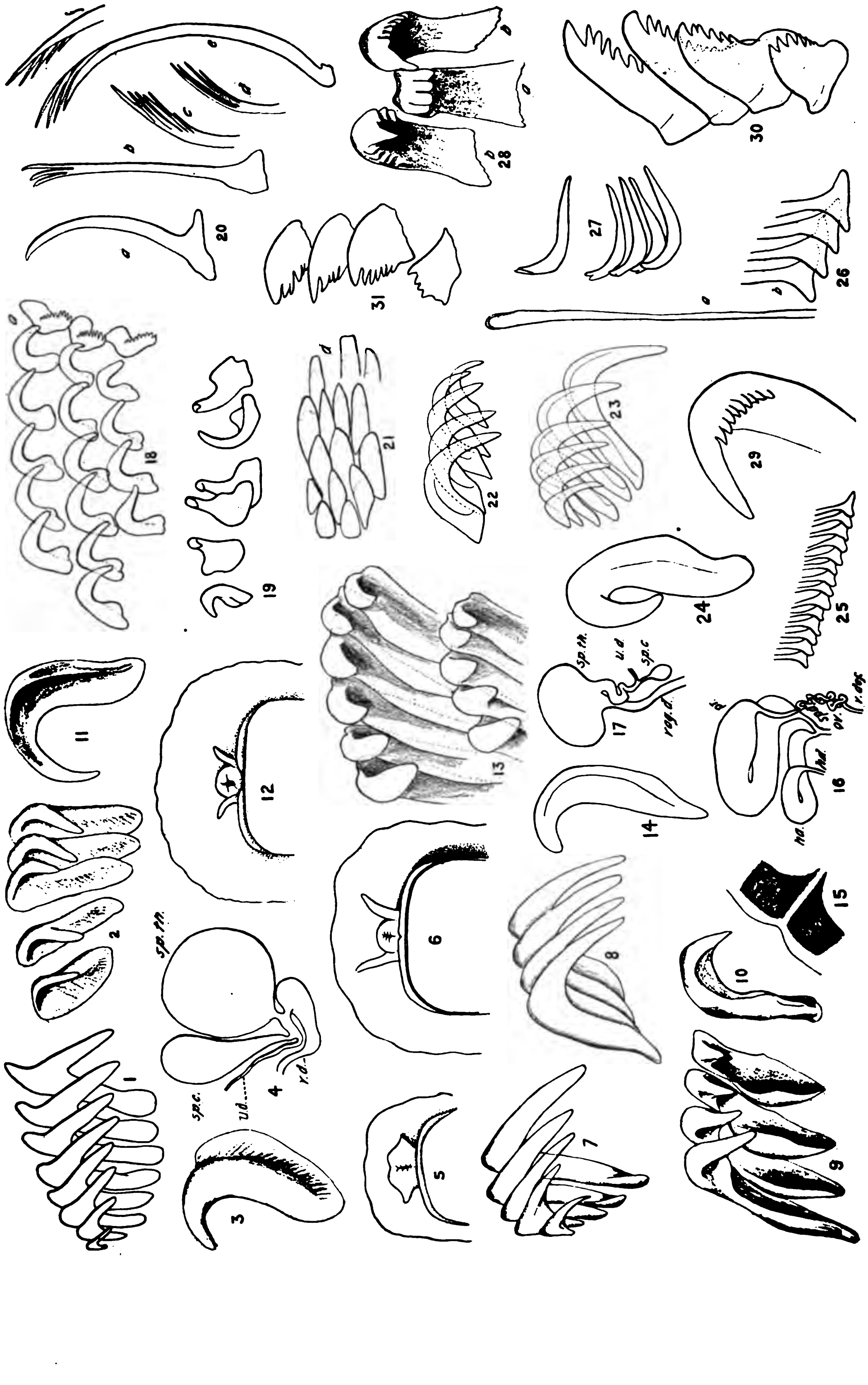

sp.m.
sp.c.
u.d.
v.d.
na.
hd.
ov.
d
sp.m.
u.d.
sp.c.
reg.d.
a
b
c
d

PLATE XIX.

Cadlina flavomaculata MacFarland.

Fig. 32.—Ventral view of animal. × 2.
Fig. 33.—Elements of labial armature isolated. × 400. (Cam.)
Fig. 34.—Rhachidian, *a*, and first pleural teeth of thirteenth to fifteenth rows. × 400. (Cam.)
Fig. 35.—Rhachidian teeth of seventh and eighth rows. × 400. (Cam.)
Fig. 36.—Inner face fourteenth to seventeenth pleuræ. × 400. (Cam.)
Fig. 37.—Outer face of *a*, nineteenth, and *b*, outermost (twenty-third) pleuræ. × 400. (Cam.)

Doriopsis fulva MacFarland.

Figs. 38, 38*a*.—*h. d.*, hermaphrodite duct; *h. amp.*, hermaphroditic ampulla; *sp. d.*, spermatic duct opening into the overlying prostate gland, which is indicated by the dotted line; *sp. c.*, spermatocyst; *sp. th.*, spermatotheca; *u. d.*, uterine duct.
Fig. 39.—Hooks near base of glans. × 120. (Cam.)
Fig. 40.—Hooks at margin of opening of glans. × 120. (Cam.)

Ægires albopunctatus MacFarland.

Fig. 41.—Upper mandible. *a*, anterior margin. × 36. (Cam.)
Fig. 42.—Innermost pleural teeth of sixth row. × 146. (Cam.)
Fig. 43.—Four outer pleuræ of fourteenth row. *a*, outermost. × 146. (Cam.)
Fig. 44.—Fifth and sixth pleuræ of sixth row. × 146. (Cam.)

Laila cockerelli MacFarland.

Fig. 45.—Ventral view of anterior end of animal, showing head, tentacles, sub-pallial ridge (*a*) and marginal papillæ. × 2.
Fig. 46.—Inner portion of sixtieth and sixty-first rows of radula. *a*, first pleural tooth; *b*, second pleural tooth; *c*, *d*, third and fourth lateral teeth. × 260. (Cam.)
Fig. 47.—First and second pleural teeth. × 400. (Cam.)
Fig. 48.—Three rhachidian plates (spurious teeth). × 400. (Cam.)
Fig. 49.—*e–n*, third to twelfth lateral (uncinal) teeth. × 400. (Cam.)
Fig. 50.—Hooks of glans penis armature. × 260. (Cam.)

Triopha carpenteri (Stearns).

Fig. 51.—Thirteenth row of radula. × 36. (Cam.)
Fig. 52.—Uncinal teeth, the seventh to fourteenth uncini, inclusive, being omitted. × 83. (Cam.)
Fig. 53.—Outermost (twelfth and thirteenth) pleuræ in front and side view. × 52. (Cam.)
Fig. 54.—Rhachidian plates of eighteenth row. × 52. (Cam.)
Fig. 55.—Labial disc. × 9. (Cam.)

Triopha maculata MacFarland.

Fig. 55*a*.—First to fourth pleuræ of tenth row of radula. × 83. (Cam.)
Fig. 56.—Uncini of tenth row of radula. × 83. (Cam.)
Fig. 57.—Rhachidian plates, *a*, of left median series; *b*, of lateral series. × 83. (Cam.)
Fig. 58.—Fourth pleural tooth, inner face. × 83. (Cam.)
Fig. 59.—Labial disk. × 8.

Triopha grandis MacFarland.

Fig. 60.—Rhachidian plates of tenth transverse row of radula. *a*, plate of left median series; *b*, of lateral series. × 60. (Cam.)
Fig. 61.—Left median rhachidian plate of fourteenth row. × 60. (Cam.)
Fig. 62.—Plural teeth, *a*, first; *b*, eighth. × 60. (Cam.)
Fig. 63.—Uncini of tenth row. × 60. (Cam.)
Fig. 64.—Isolated hooks of glans penis armature. × 260. (Cam.)

PLATE XIX.

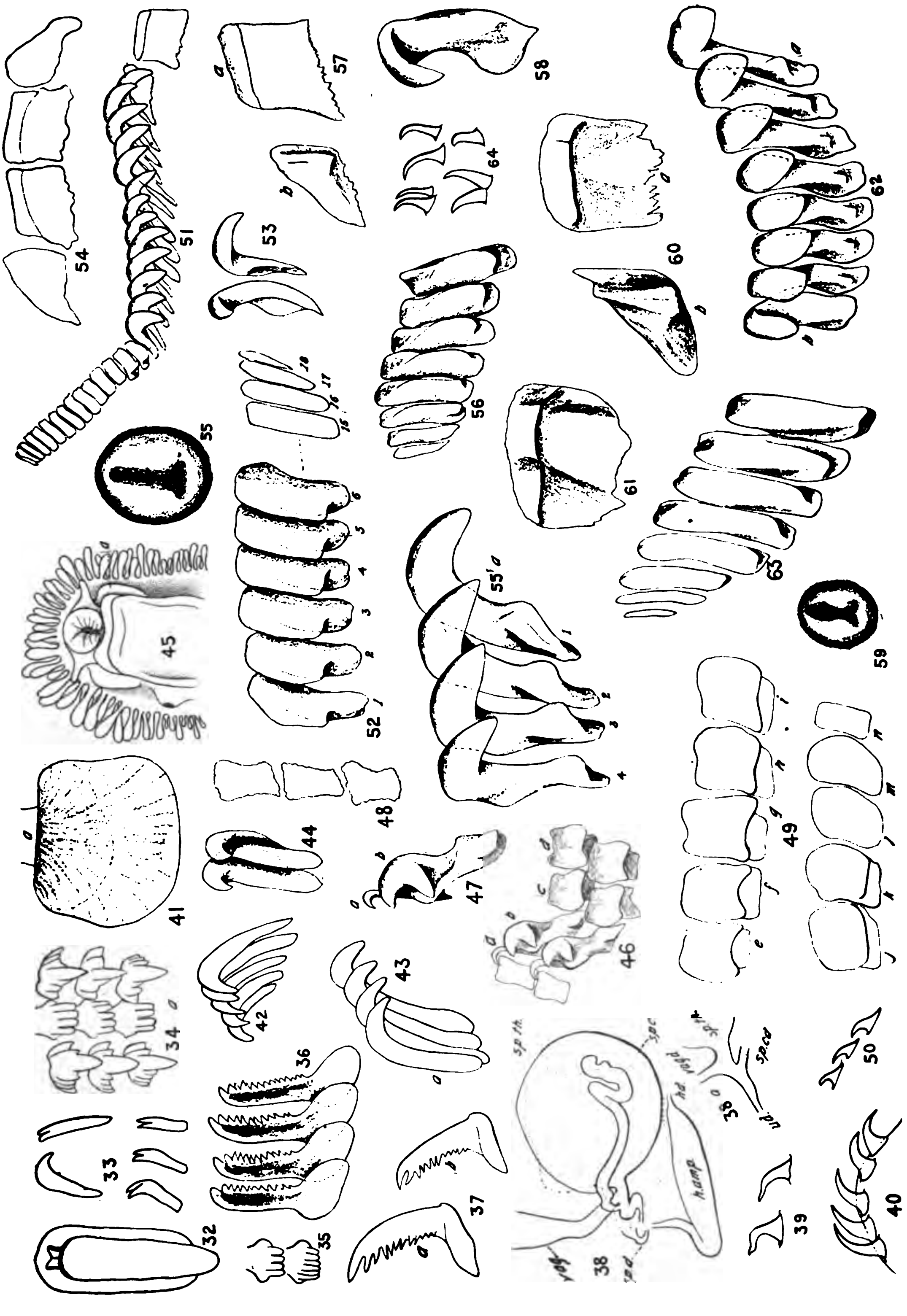

55'a
sp.th.
sp.c.
h.amp.
hd.
sp.d.
sp.cd.
a
b
c
d

PLATE XX.

Polycera atra MacFarland.

FIG. 65.—Ventral view of anterior end of animal.
FIG. 66.—Outer face of mandibles. × 36. (Cam.)
FIG. 67.—Inner face of mandibles from behind. × 36. (Cam.)
FIG. 68.—Longitudinal median section through front of mandibles along line *a–b* of figure 66. × 60. (Cam.)
FIG. 69.—Fourth row of radula. × 83. (Cam.)
FIG. 70.—Uncinal plates, the outermost rudimentary. × 83. (Cam.)
FIG. 71.—Armature of glans penis. × 400. (Cam.)
FIG. 72.—Front view of cutting edges of mandibles. × 36. (Cam.)

Acanthodoris hudsoni MacFarland.

FIG. 73.—Ventral view of anterior end of animal. × 2.
FIG. 74.—Side view of labial armature. × 36. (Cam.)
FIG. 75.—Side view of blade-like processes at ventral portion of labial armature. × 120. (Cam.)
FIG. 76.—Dorsal view of blade-like processes of labial armature. × 146. (Cam.)
FIG. 77.—Inner face first pleural teeth of second and third rows. × 83. (Cam.)
FIG. 78.—Outer pleuræ shown in their relative position to the tip of the first pleural tooth. × 212. (Cam.)
FIG. 79.—Isolated hooks of labial armature. × 263. (Cam.)
FIG. 80.—*v. d.*, vaginal duct; *gl.*, its glandular portion; *a.*, its proximal loop; *sp. th.*, spermatotheca; *sp. c.*, spermatocyst; *u. d.*, uterine duct.

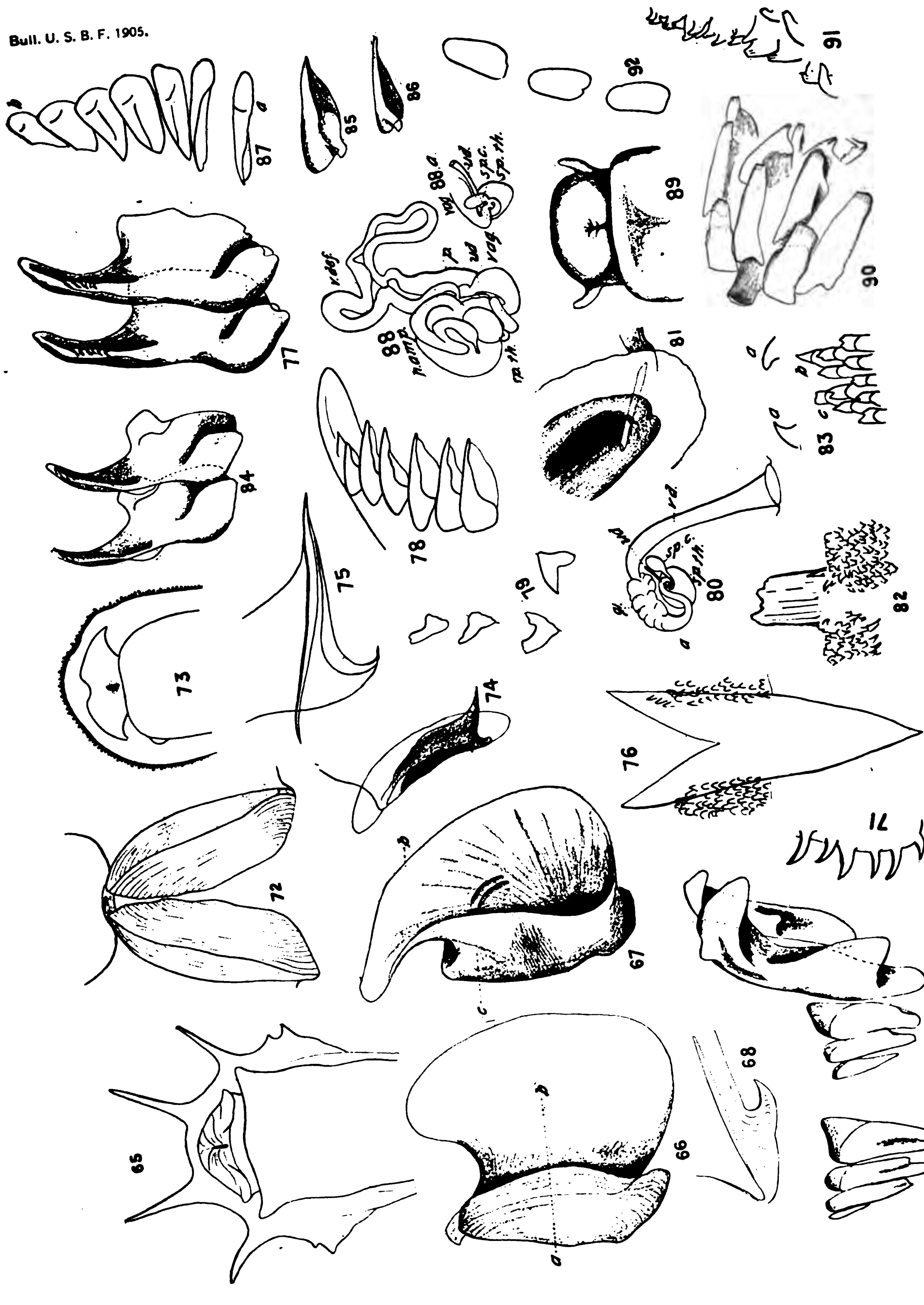
Acanthodoris brunnea MacFarland.

FIG. 81.—Labial armature obliquely from in front, with ventral blade-like process. × 52. (Cam.)
FIG. 82.—Dorsal view of blade-like process. × 120. (Cam.)
FIG. 83.—Elements of labial armature, *a*, in side view; *b*, pointed hook; *c*, blunt hook.
FIG. 84.—First pleural teeth of ninth and tenth rows. × 83. (Cam.)
FIG. 85.—Second pleural tooth. × 212. (Cam.)
FIG. 86.—Third pleural tooth. × 212. (Cam.)
FIG. 87.—Outer pleural teeth. *a*, third; *b*, ninth. × 212. (Cam.)
FIG. 88.—Reproductive organs from above. *vag.*, vagina; *p.*, penis; *v. def.*, vas deferens; *h. amp.*, hermaphroditic ampulla; *sp. th.*, spermatotheca; *sp. c.*, spermatocyst; *u. d.*, uterine duct. × 10. (Cam.)
FIG. 88*a*.—Relations of vaginal duct (*vag.*), uterine duct (*u. d.*), spermatocyst (*sp. c.*), and spermatotheca (*sp. th.*) from below. × 10. (Cam.)

Ancula pacifica MacFarland.

FIG. 89.—Ventral view of head of animal.
FIG. 90.—Elements of labial armature. × 212. (Cam.)
FIG. 91.—Upper end of labial armature. × 212. (Cam.)
FIG. 92.—Median plates of radula.

PLATE XX.


65
66
a
b
c
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68
69
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73
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75
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vul.
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a
pr
vd.
sp.c.
sp.th.
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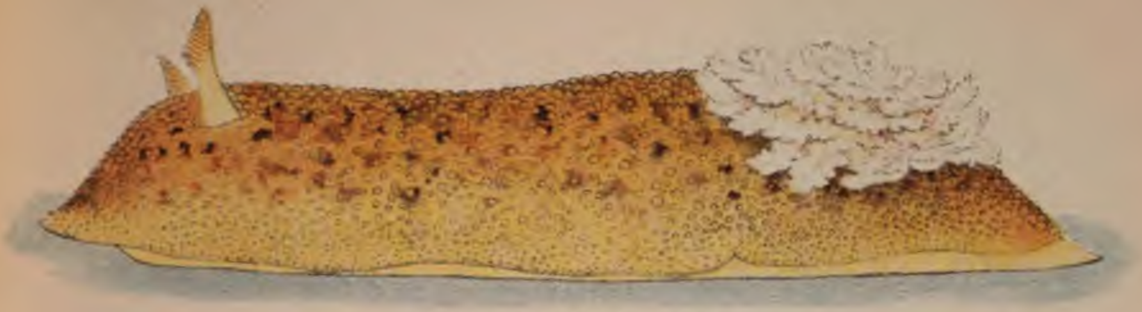
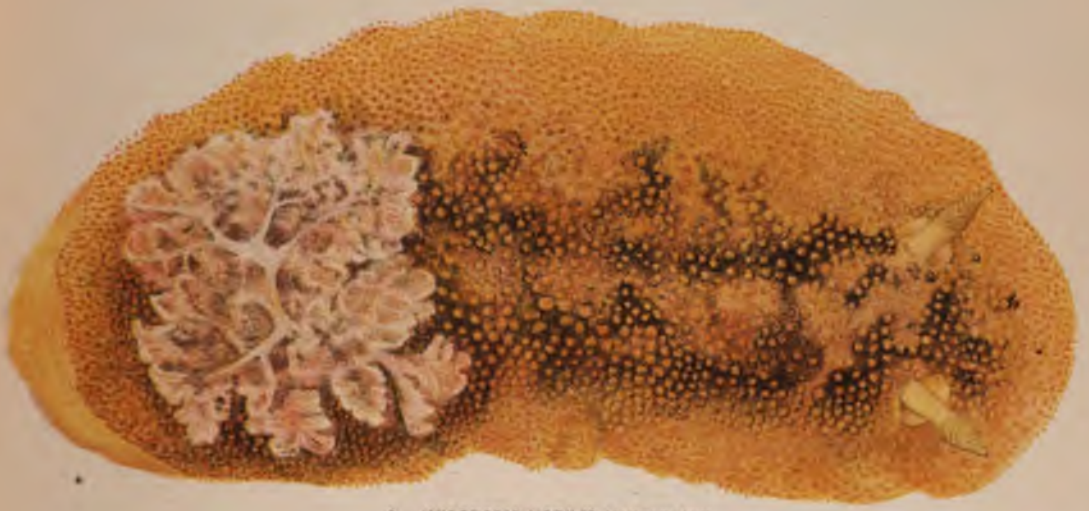
85
86
87
a
88
v.def.
n.amp.
va.th.
pr
ud
vag
88 a
vag
ud
sp.c.
sp.th.
89
90
91
92

NOTE.

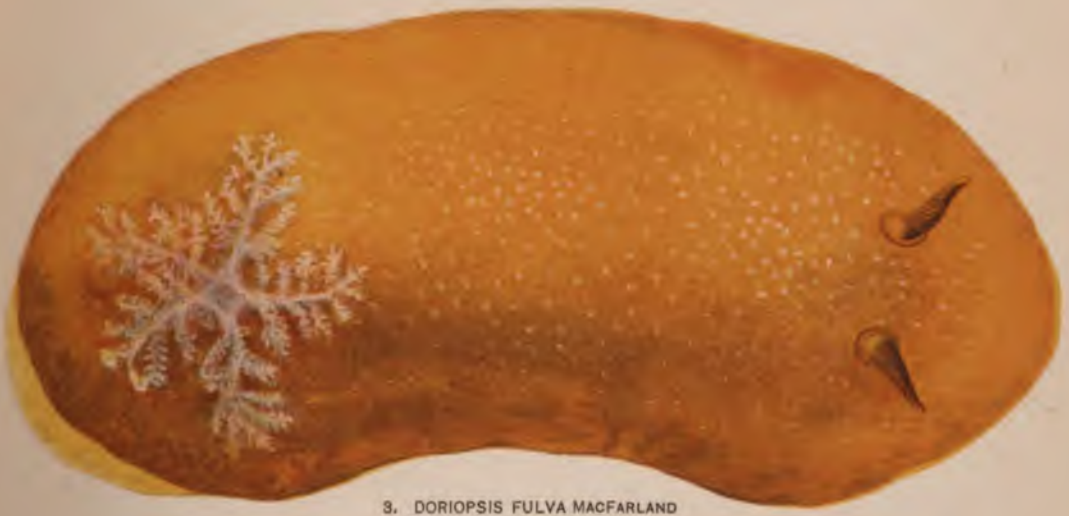
All of the figures of plates XXII to XXXI, with the exception of figures 4, 19, and 22, were painted from life by Mrs. Anna B. Nash, formerly artist of the Hopkins Seaside Laboratory. Figure 4 was painted from life by Mrs. Olive H. MacFarland. Figures 19 and 22 were redrawn from incomplete color sketches.



1. ANISODORIS NOBILIS MACFARLAND
Lateral view, .875 natural size

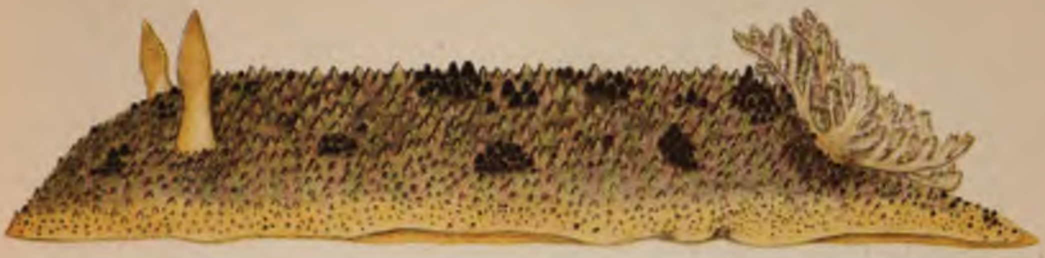


2. ANISODORIS NOBILIS MACFARLAND
Dorsal view, .875 natural size

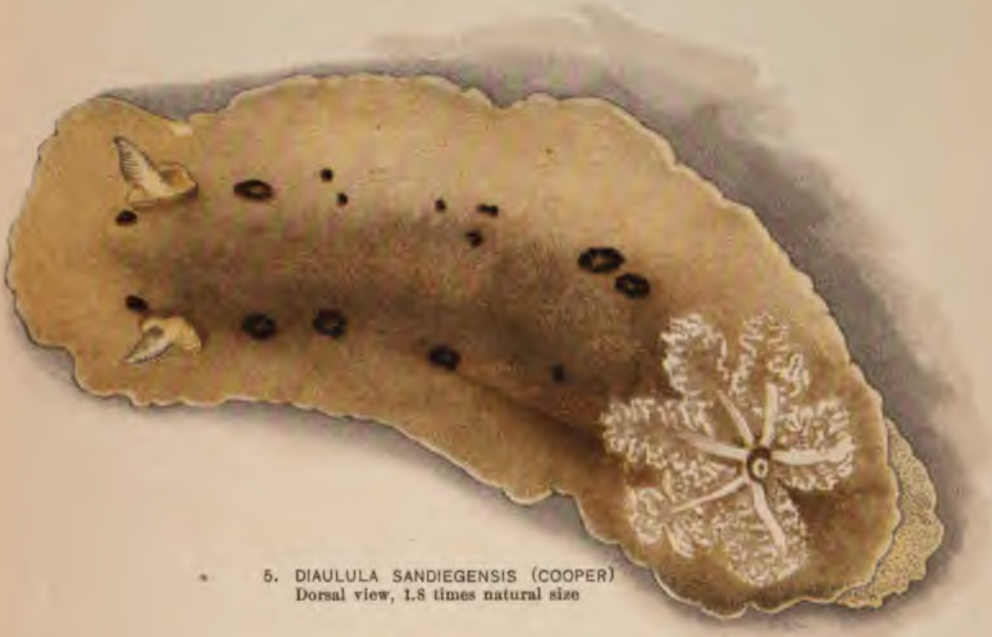


3. DORIOPSIS FULVA MACFARLAND
Dorsal view, twice natural size

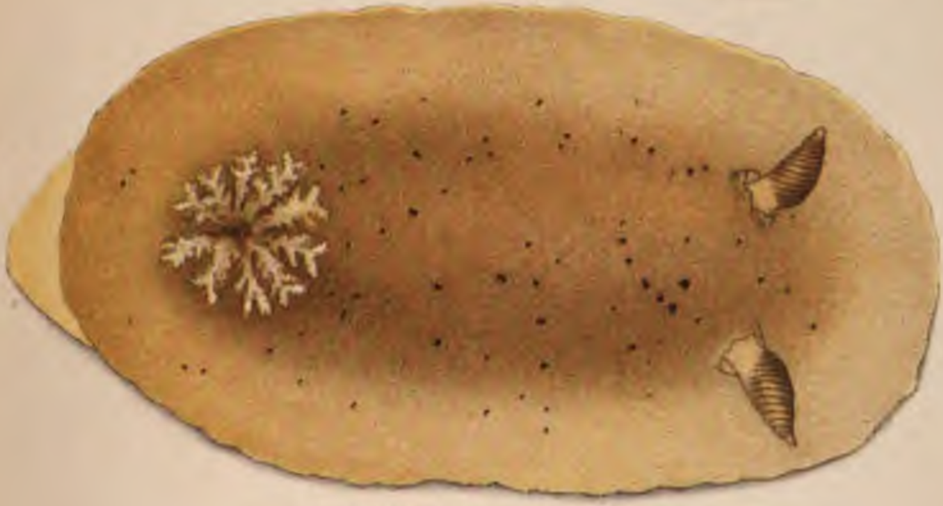
A. HOEN & CO., LITH.



4. ARCHIDORIS MONTEREYENSIS (COOPER)
Lateral view, twice natural size

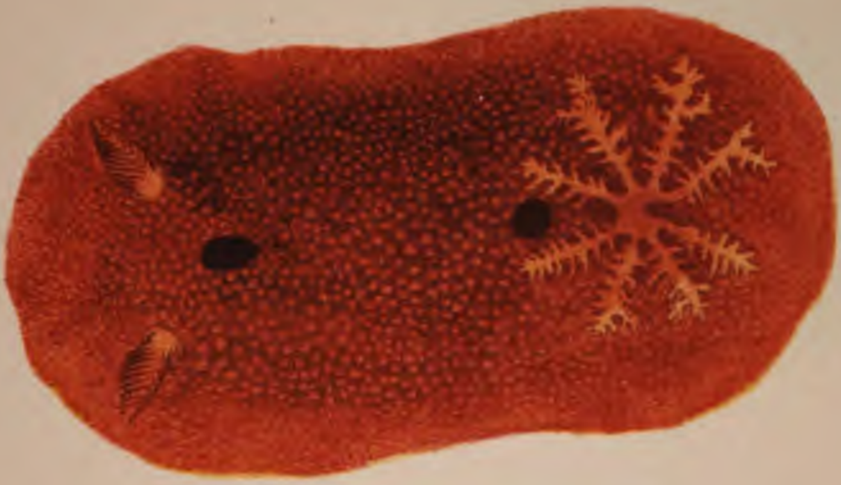


5. DIAULULA SANDIEGENSIS (COOPER)
Dorsal view, 1.8 times natural size

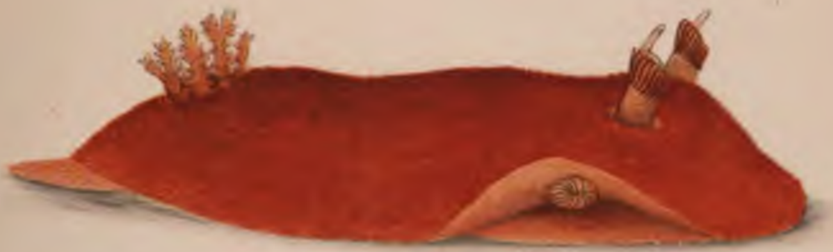


6. DISCODORIS HEATHI MACFARLAND
Dorsal view, 10 times natural size

A. HOEN & CO., LITH.

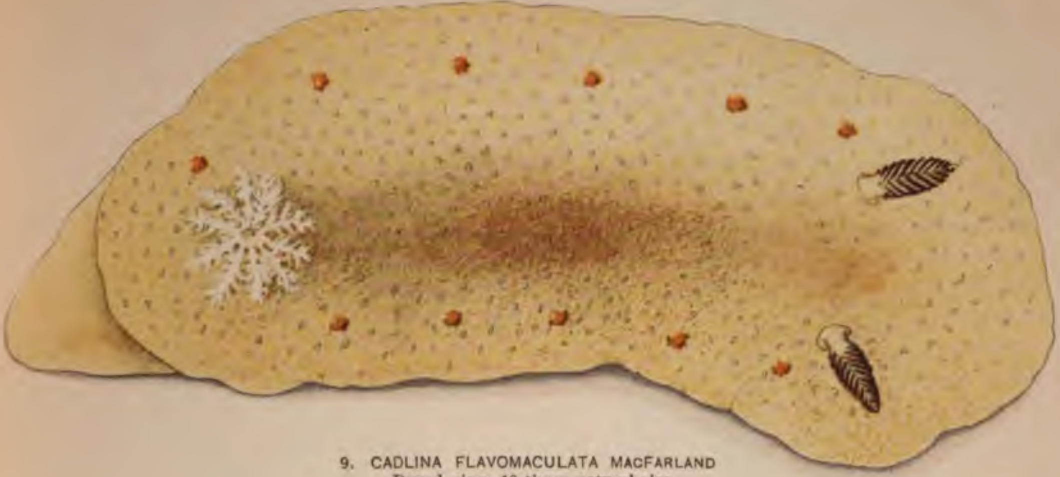


7. ALDISA SANGUINEA (COOPER)
Dorsal view, 7 times natural size

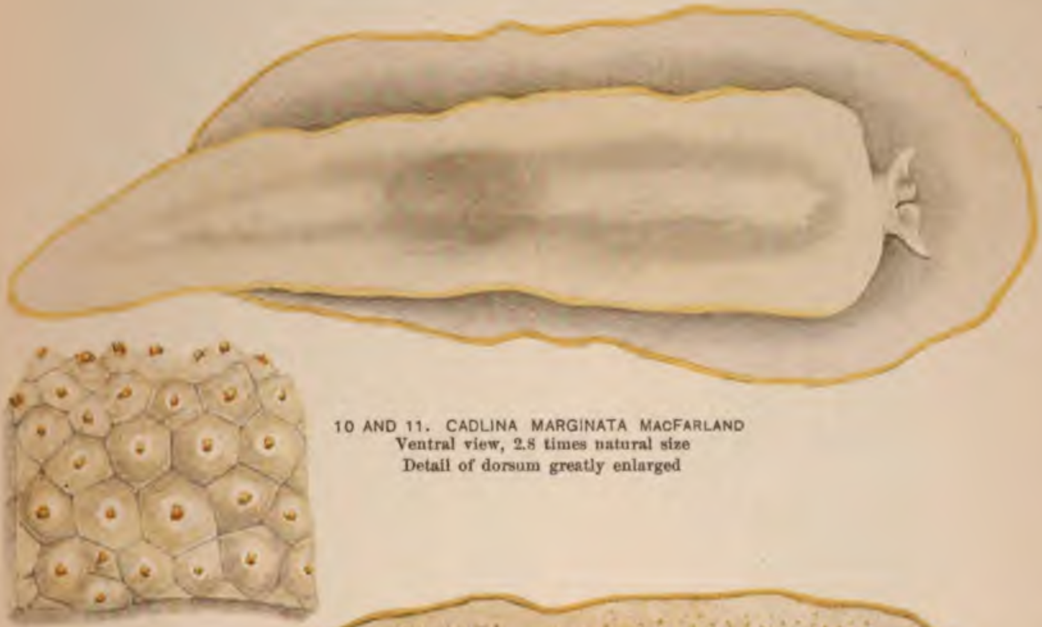


8. ROSTANGA PULCHRA MACFARLAND
Lateral view, 10 times natural size

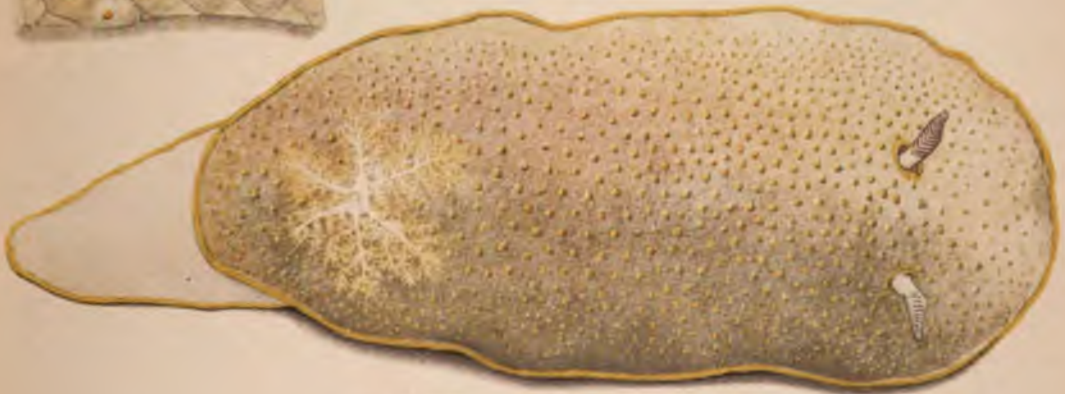
A. HOEN & CO., LITH.



9. CADLINA FLAVOMACULATA MACFARLAND
Dorsal view, 10 times natural size

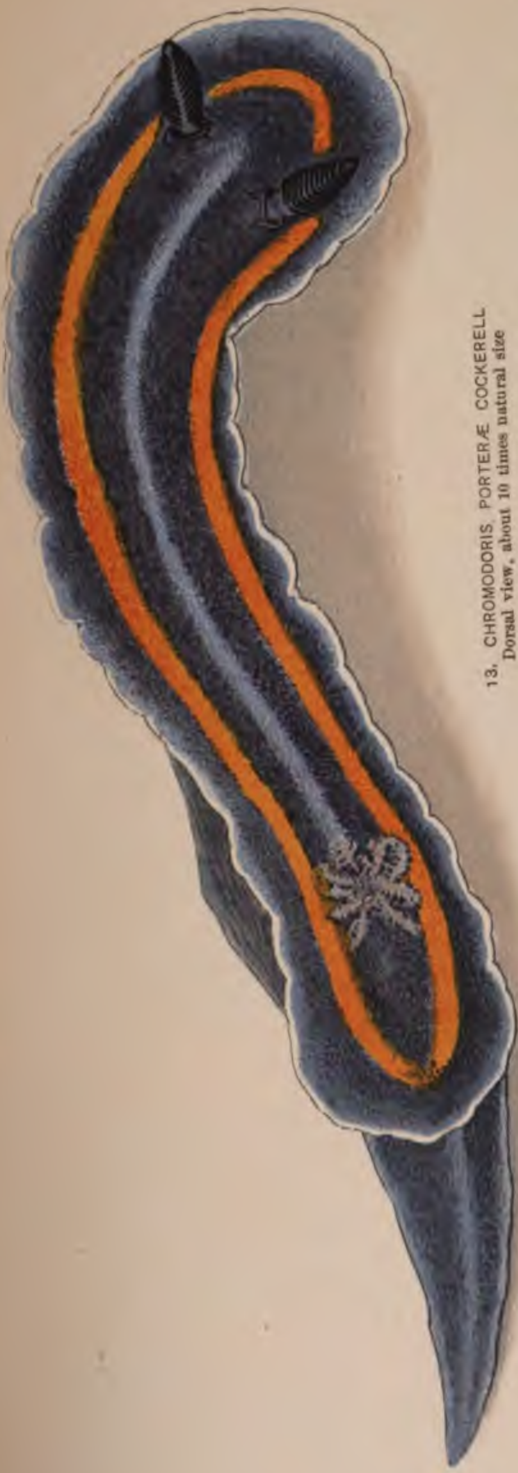


10 AND 11. CADLINA MARGINATA MACFARLAND
Ventral view, 2.8 times natural size
Detail of dorsum greatly enlarged

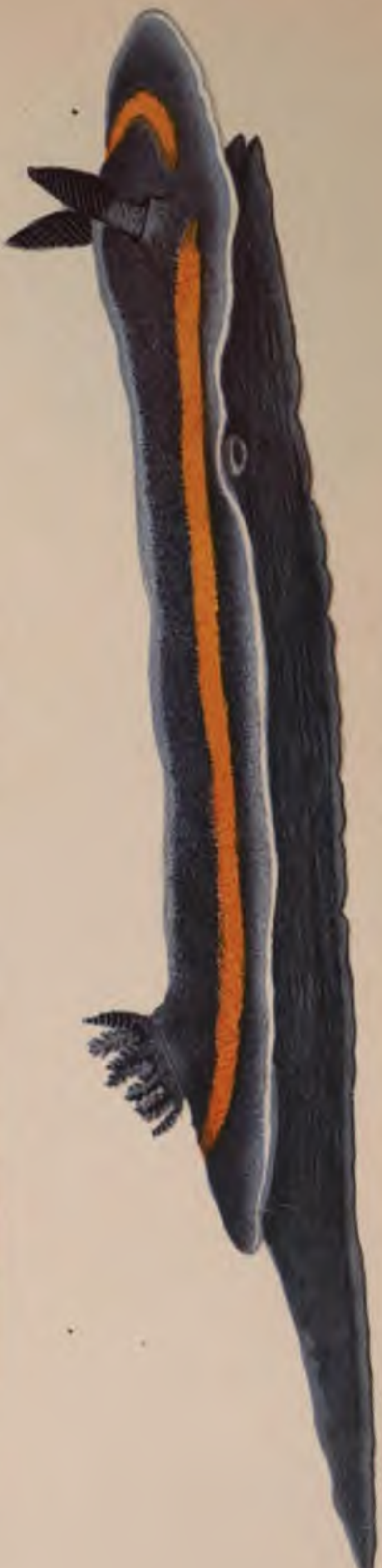


12. CADLINA MARGINATA MACFARLAND
Dorsal view, 2.8 times natural size

A. HOEN & CO., LITH.

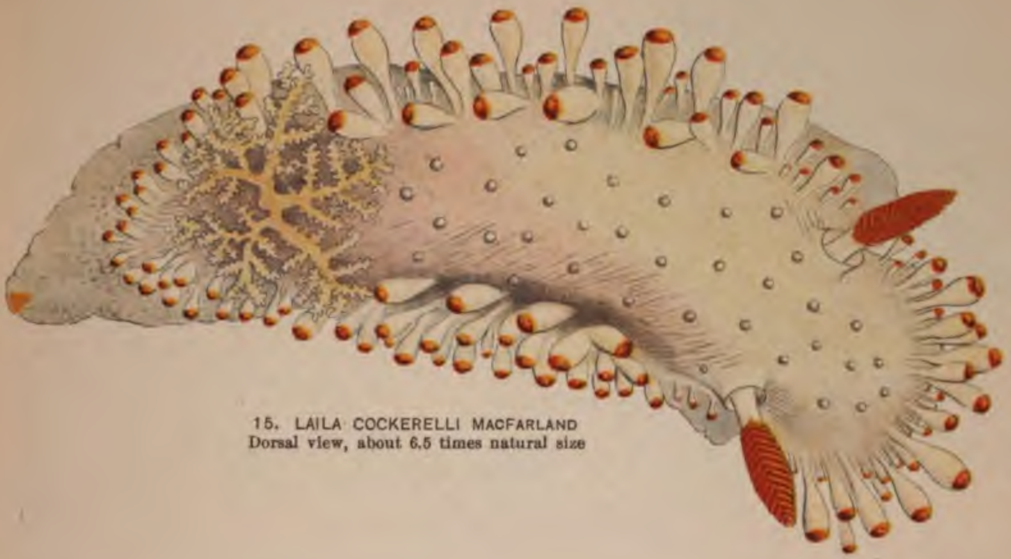


13. CHROMODORIS PORTERÆ COCKERELL
Dorsal view, about 10 times natural size

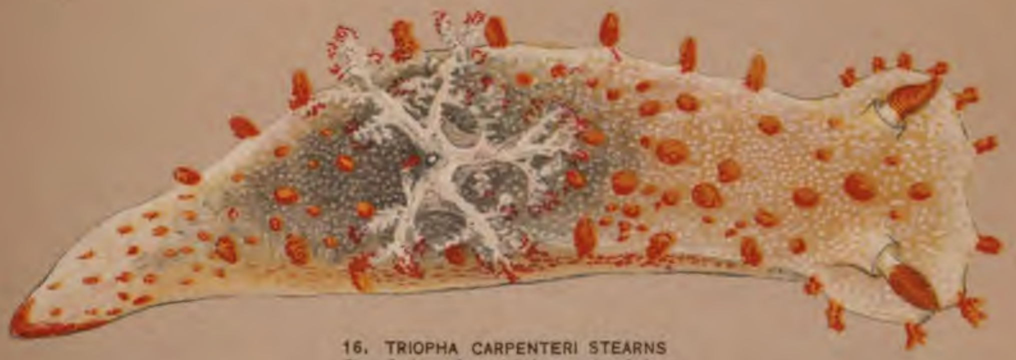


14. CHROMODORIS PORTERÆ COCKERELL
Lateral view, about 10 times natural size

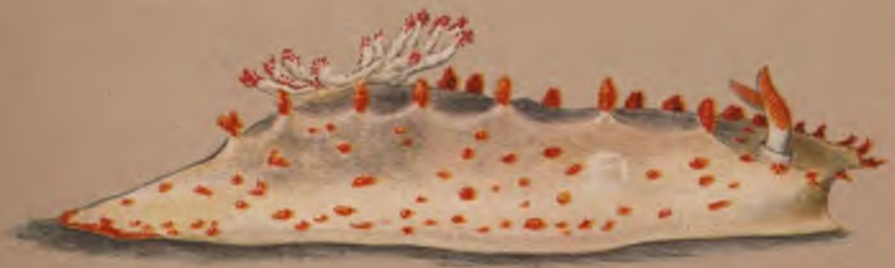
A. HOEN & CO., LITH.



15. LAILA COCKERELLI MACFARLAND
Dorsal view, about 6.5 times natural size

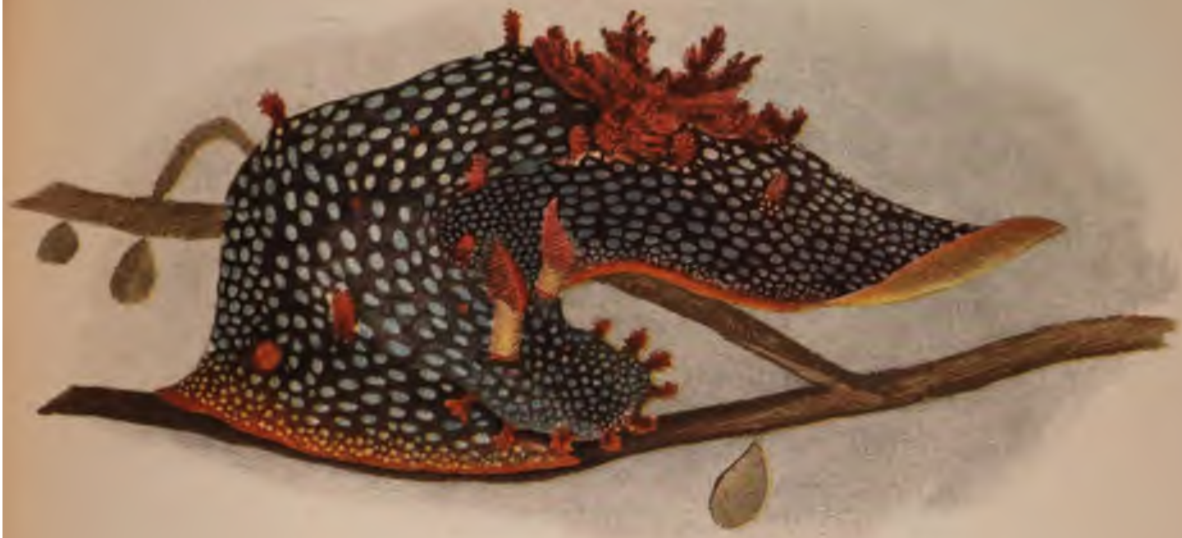


16. TRIOPHA CARPENTERI STEARNS
Dorsal view, about 1.5 times natural size

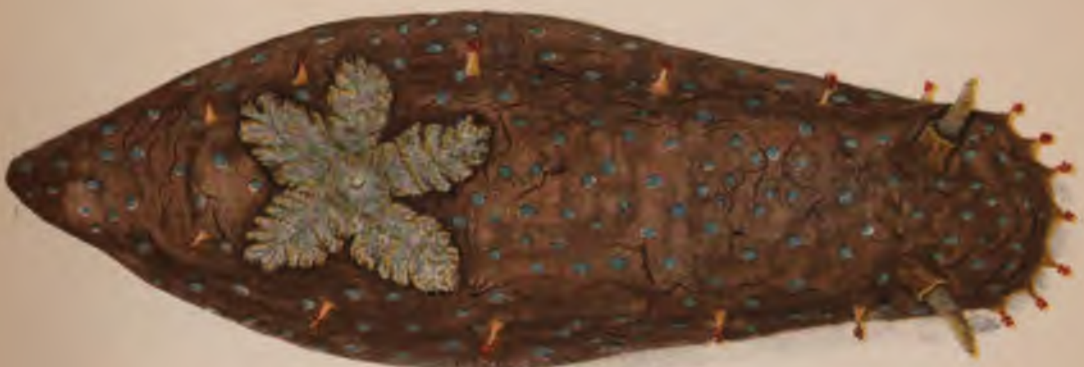


17. TRIOPHA CARPENTERI STEARNS
Lateral view, about 1.5 times natural size

A. HOEN & CO., LITH.

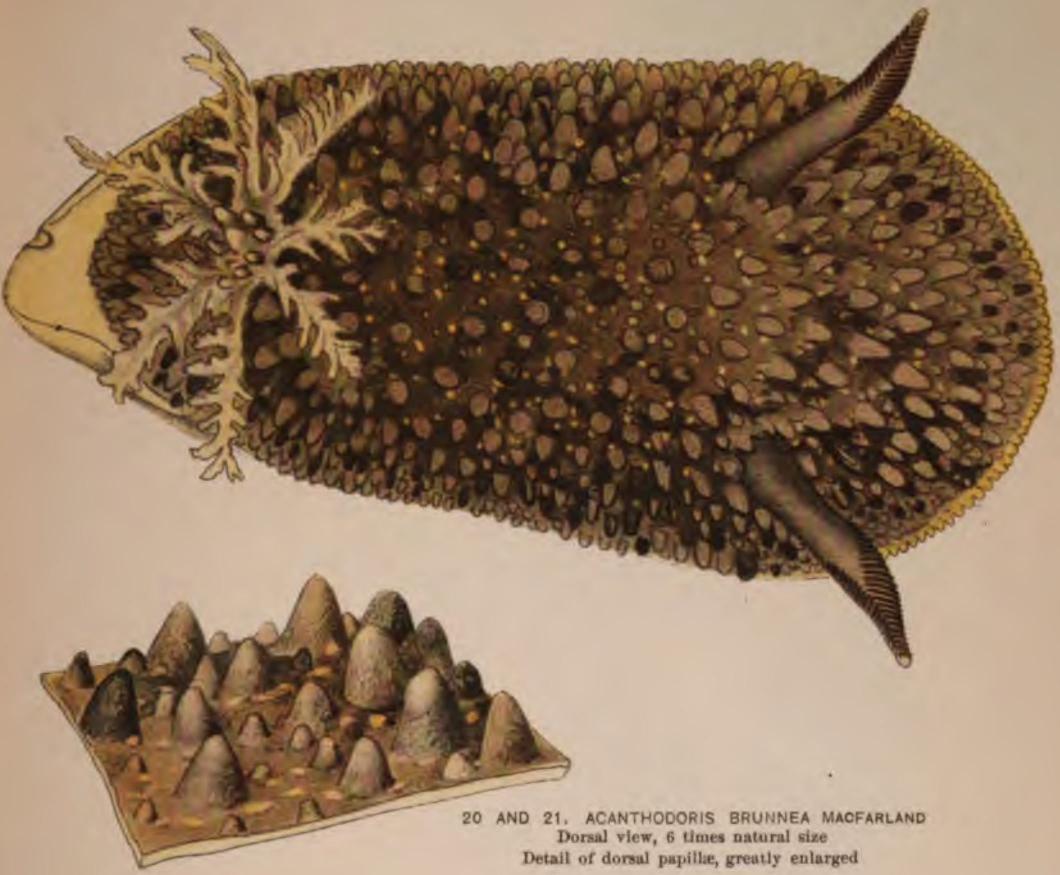


18. TRIOPHA MACULATA MACFARLAND
Dorso-lateral view, about 1.5 times natural size

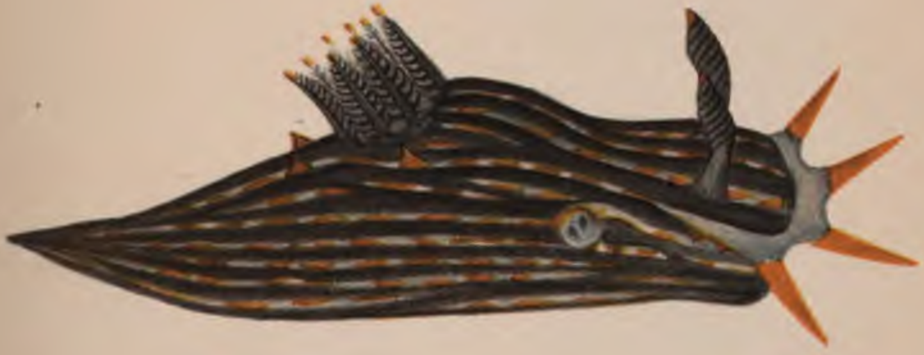


19. TRIOPHA GRANDIS MACFARLAND
Dorsal view, slightly larger than life

A. HOEN & CO., LITH.

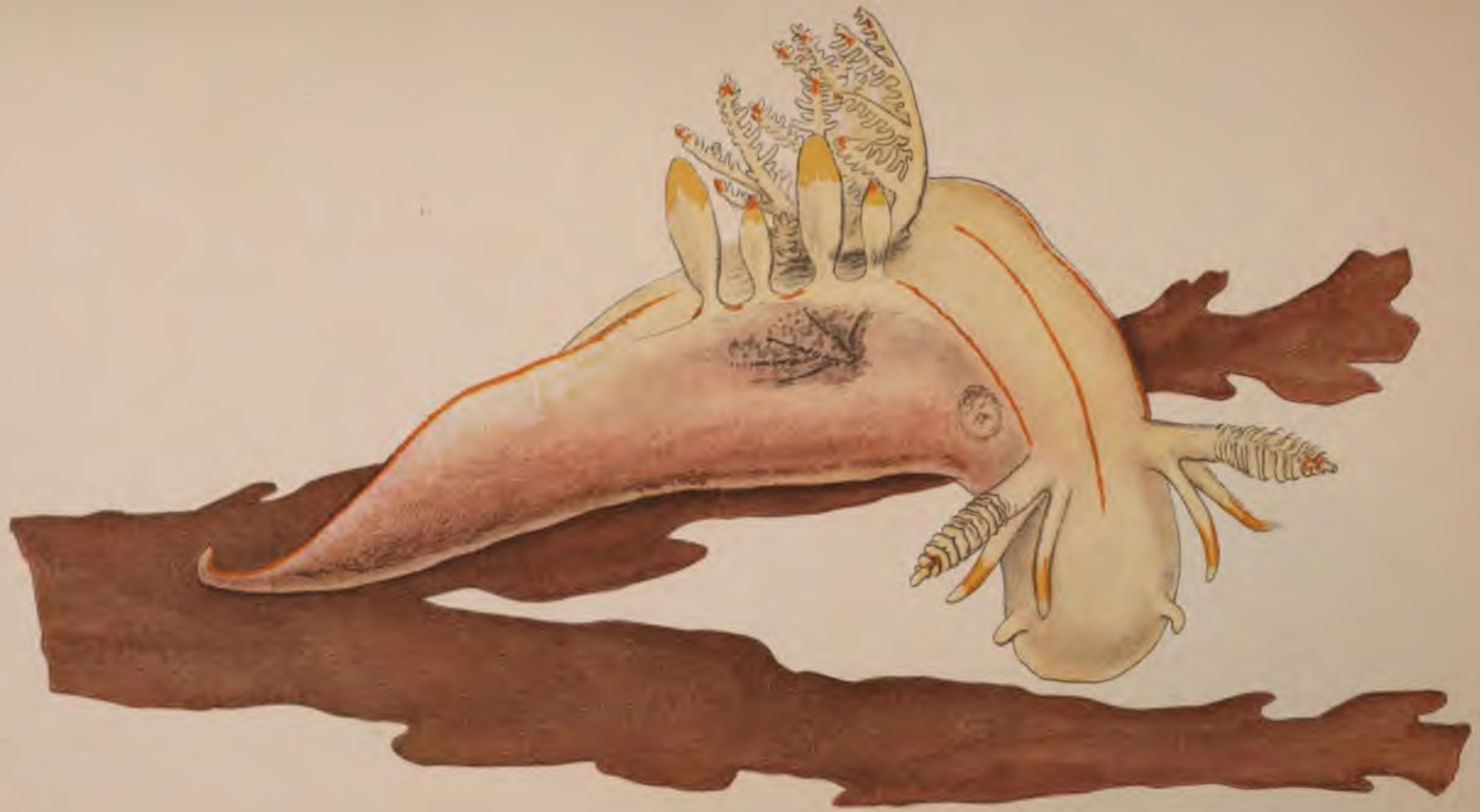


20 AND 21. ACANTHODORIS BRUNNEA MACFARLAND
Dorsal view, 6 times natural size
Detail of dorsal papillæ, greatly enlarged



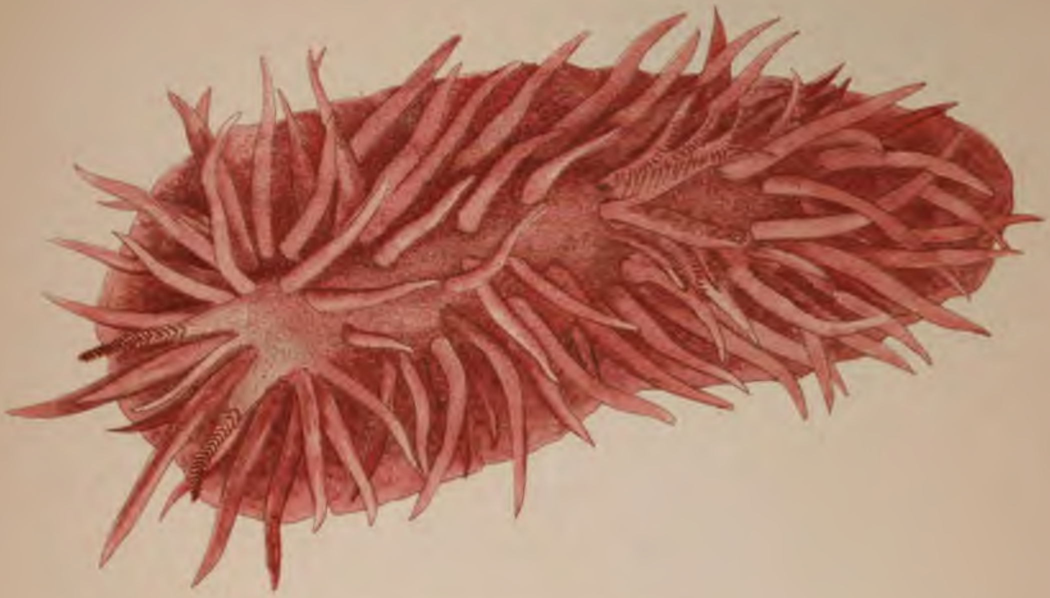
22. POLYCERA ATRA MACFARLAND
Lateral view, 5 times natural size

A. HOEN & CO., LITH.

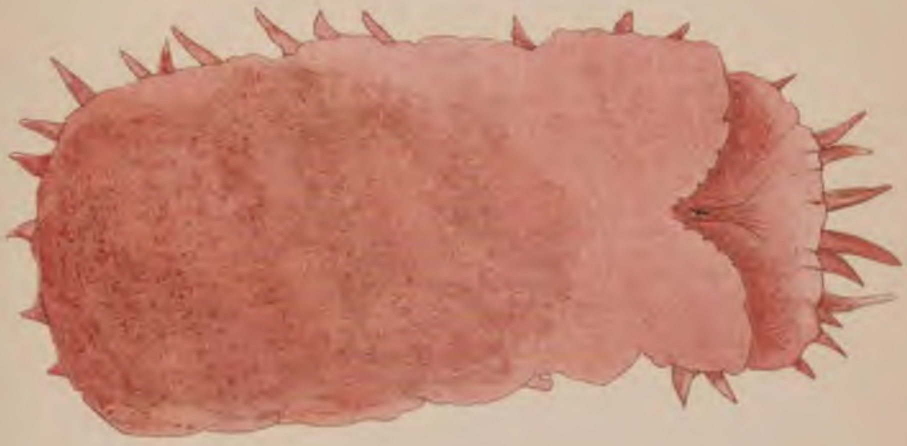


23. ANCULA PACIFICA MACFARLAND
Dorso-lateral view, about 10 times natural size

A. HOEN & CO., LITH.



24. HOPKINSIA ROSACEA MACFARLAND
Dorsal view, 5 times natural size



25. HOPKINSIA ROSACEA MACFARLAND
Ventral view, 5 times natural size

A. HOEN & CO., LITH.

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